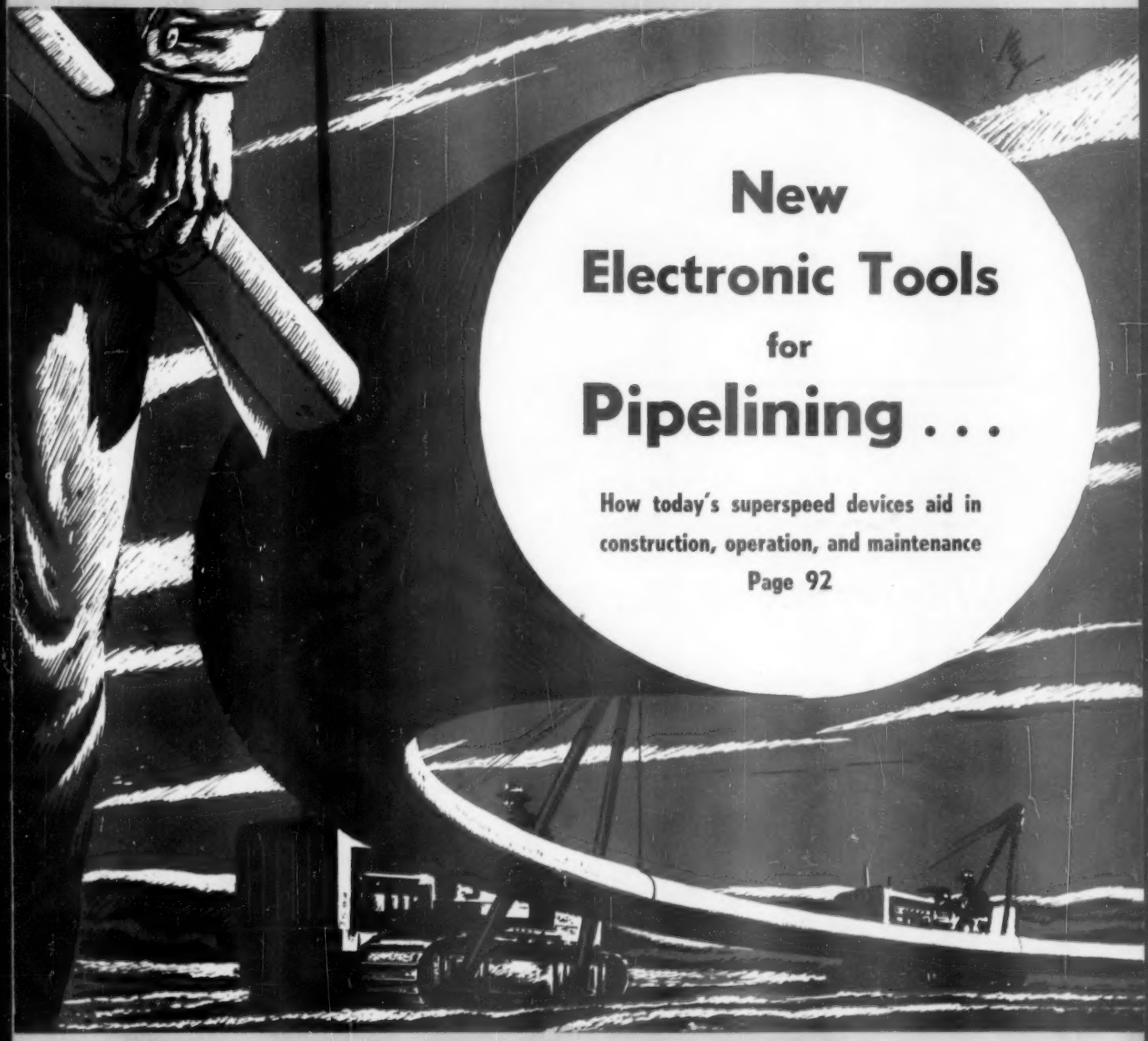
FEBRUARY 7, 1955

the OIL AND GAS JOURNAL



New Electronic Tools for Pipelining . . .

How today's superspeed devices aid in construction, operation, and maintenance
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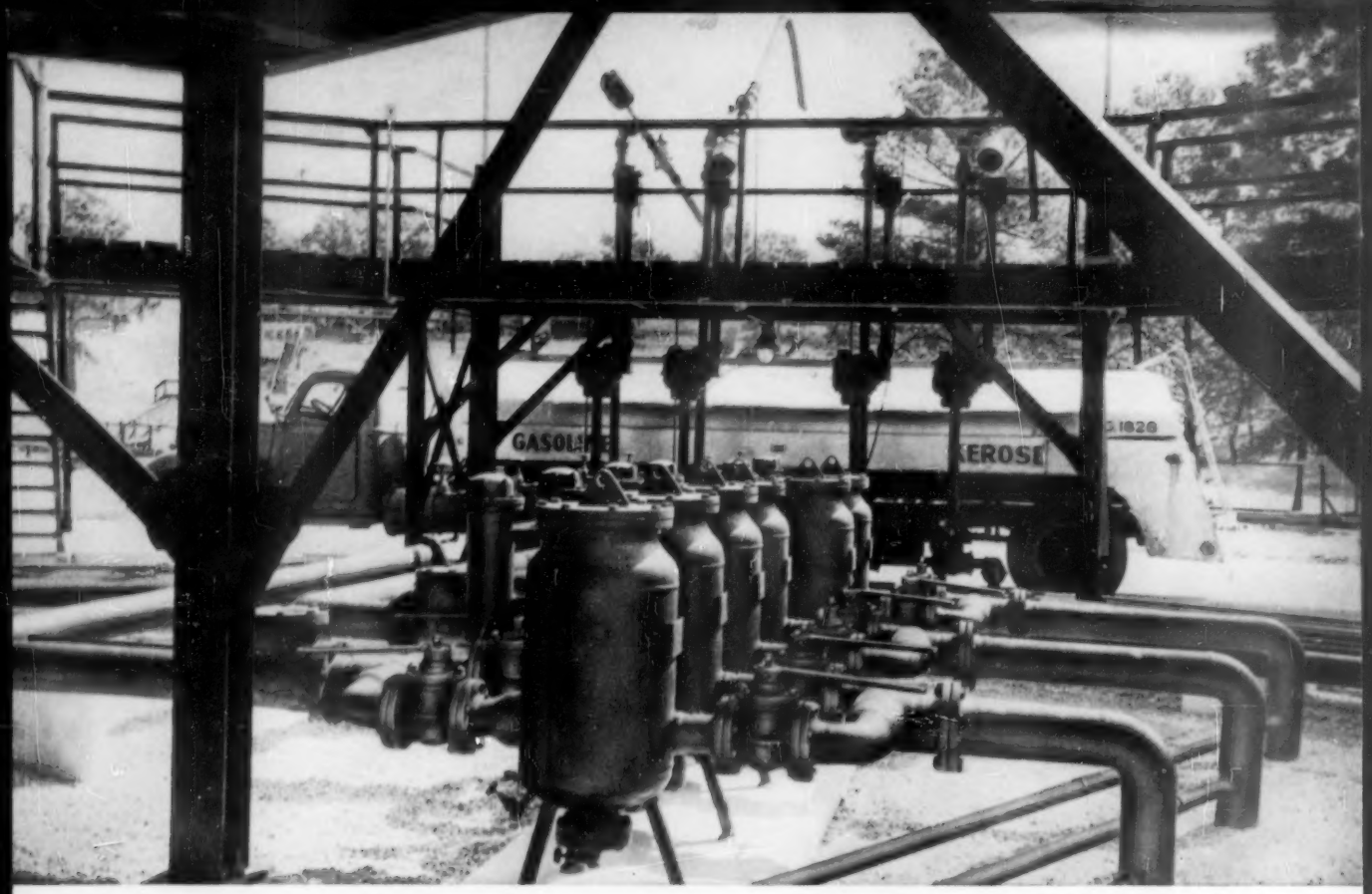
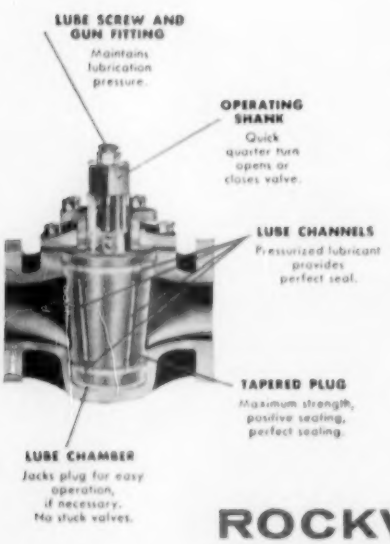


Leakproof, Fast, Economical Service on Loading Racks

With **Rockwell**-Nordstrom **Valves**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Rockwell-Nordstrom valves are the most efficient and economical valves you can use on loading racks . . . or any petroleum marketing installation. Quarter-turn operation assures fast, positive flow control, and Rockwell-Nordstrom's pressurized lubricant sealing gives you leakproof service that eliminates costly, dangerous wastage.

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Whatever your valve needs, there is a Rockwell-Nordstrom valve and lubricant that will do the job more efficiently, more dependably and at lower cost than any other valve you've ever used. Write for complete information today and learn how Rockwell-Nordstrom can put new profits in your petroleum marketing operations. Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited.

ROCKWELL-Nordstrom **VALVES**

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

PAGE 1 ONE . . . *a glance ahead*

Coal interests won't get to first base in plea for Government to "do something" to force Caribbean refineries to rebuild so as to produce less residual fuel oil for shipment to U. S. Refineries were designed primarily to handle heavy Venezuelan crude.

No need to worry about scarcity of petroleum during next decade or so. This is now prevailing view in official Washington. It reflects in administration attitude toward synthetic fuels, other industry problems.

First real test to determine when and if jet bits are better than conventional bits is being made by a West Texas drilling contractor. Size of mud nozzles can be changed while bit is on bottom, giving comparison of penetration rate of various sizes under identical drilling conditions.

Gas lawyers suspect FPC pulled a fast one in Order 174-B. Instead of easing requirements, it appears to bring natural-gasoline plants specifically under regulation for the first time. Gimmick is in paragraph inviting plant operators to file for their gas suppliers.

Gap is widening between geophysicists and geologists. Next month will see the last joint meeting of oil finders. Thereafter geophysicists will hold separate convention, losing opportunity to exchange information with other exploration scientists.

Some leaders in the fight on imports urge domestic producers to pitch their argument on the plea that the public will be endangered by too much dependence on foreign oil. They say congressmen don't work up much sympathy for producers' troubles; can't believe all oil men aren't rich.

Conservation and proration are taking a beating all around. Illinois, California, and Rocky Mountain states are in a mood to reject modern laws. Oklahoma Legislature is considering weakening its law. Big volume of unprorated foreign and domestic crude may undermine conservation elsewhere.

New concept in microwave communication, "forward scattering," may cut in half number of relay stations needed by a pipeline. Two pipeline companies may install test links this year if current experiments of A. T. & T. pan out.

the OIL AND GAS JOURNAL

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EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING
OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS

. . . an integrated magazine serving an integrated industry

TECHNOLOGY—OPERATION

What's New in Pipeline Electronics? 92

By C. C. Keane

At present largest pipeline investments in electronic applications are in the field of communication. Here microwave has provided rapid strides in economical means of voice transmission, for teletype, and for control circuits. Progress is slower in substituting electronic equipment for more conventional instruments at pumping stations. In product systems electronic apparatus offers means for consolidating data and control of power equipment.

Reduce Your Instrument Maintenance 96

By E. D. Mattix

Reduction of maintenance in instrumentation depends upon a number of things. Detailed attention should be given to choice of instruments for difficult applications. Thorough instruction should be given in each type of instrument. A number of detailed examples are given.

Southwest Muldoon Now Developed 100

By Lloyd J. Ryman

This field, typical of a cluster of small shallow oil fields which produced from a series of fault closures, now believed fully developed. The Steinhauser sand has provided the major portion of the field's production. There are 24 producing wells.

Phillips Tests Air-Mud Drilling 104

By Roy A. Bobo, George S. Ormsby, and R. S. Hoch

The introduction of both air and mud into the drill string requires separate equipment for each phase. The mud phase remains identical to that employed in conventional mud drilling. The air is delivered by a compressor into the standpipe. On returning from the hole air is separated from mud in a separation chamber before the mud goes to the pit.

Lessons From Deepest Well 109

World's deepest well is a dry hole abandoned at 21,482 ft. This is 961 ft. deeper than previous record holder.

Spacing Gas-Lift Valves 110

By C. V. Kirkpatrick

Proper spacing of gas-lift valves is nothing more than arriving at a correct force and pressure balance for the expected set of conditions. Operating flow gradient is a highly significant term. This article deals with pressure loaded valves.

New Water-Flood Plant 113

By Knight Thornton

A new water-flood plant has been installed in Allegany field, western New York State. This marks 35 years' experience with this technique in this area.

Crude Oil To Ethylene 114

Montecatini petrochemical plant at Ferrara, Italy, is scheduled for completion this summer. Key raw material is ethylene. Oxo synthesis will be employed. Plant capacity: 13,200,000 lb. per year of polyethylene; 17,600,000 of polystyrene, and 12,000,000 acetone.

On-The-Job: In the Fields 116

Try using three overload relays instead of two for better protection of three-phase beam-pumping motors. This is most practical protection against excessive temperatures caused by unbalanced voltage conditions.

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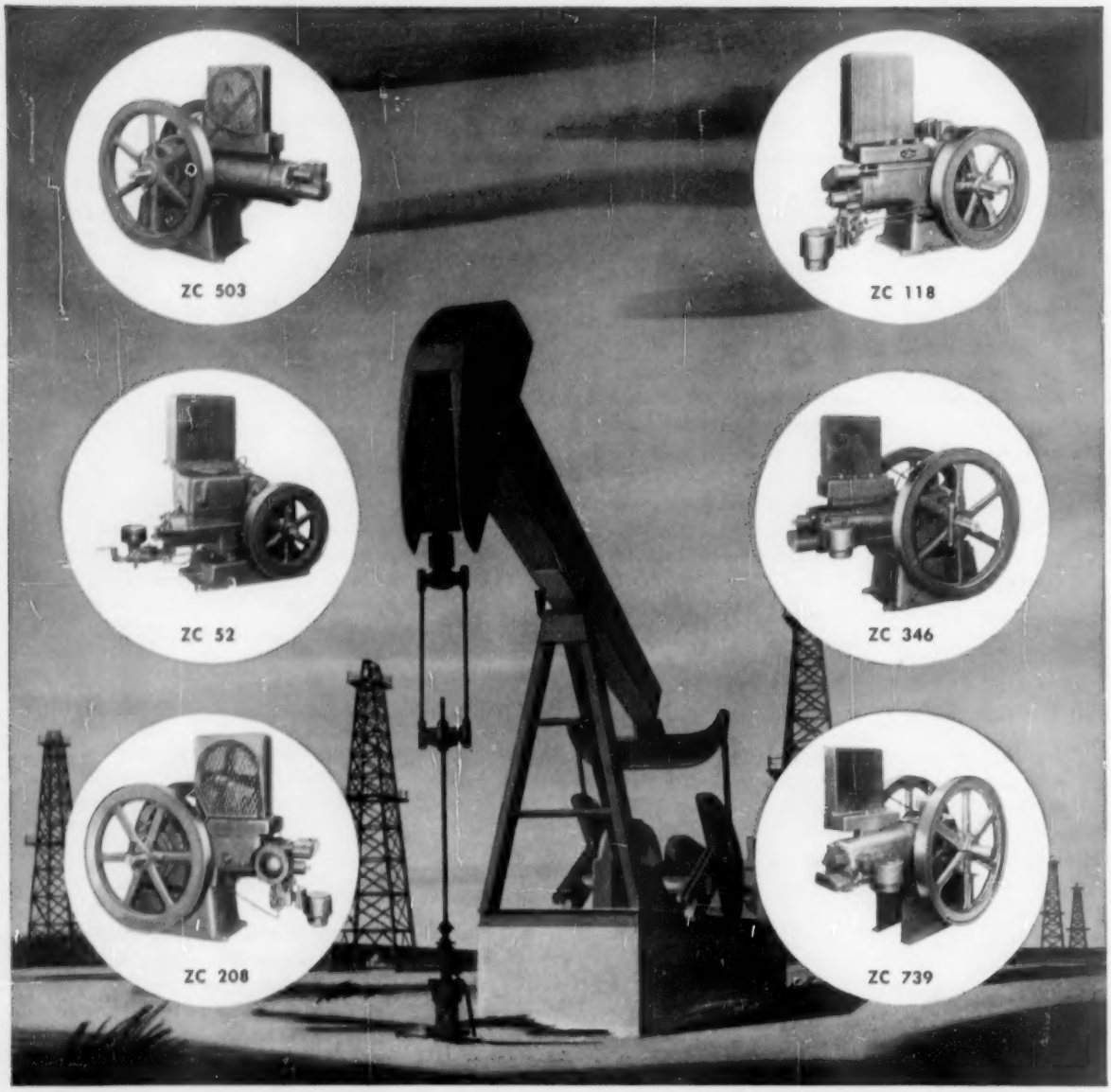

Good fit for better performance

Yes, from the broad line of Fairbanks-Morse "ZC" Engines, you can *fit* the engine to the pumping unit. No need to overpower and waste money . . . no need to underpower and take the chance of breakdown. From 3 to 30 hp. there's a "ZC" that will ideally answer your requirements.

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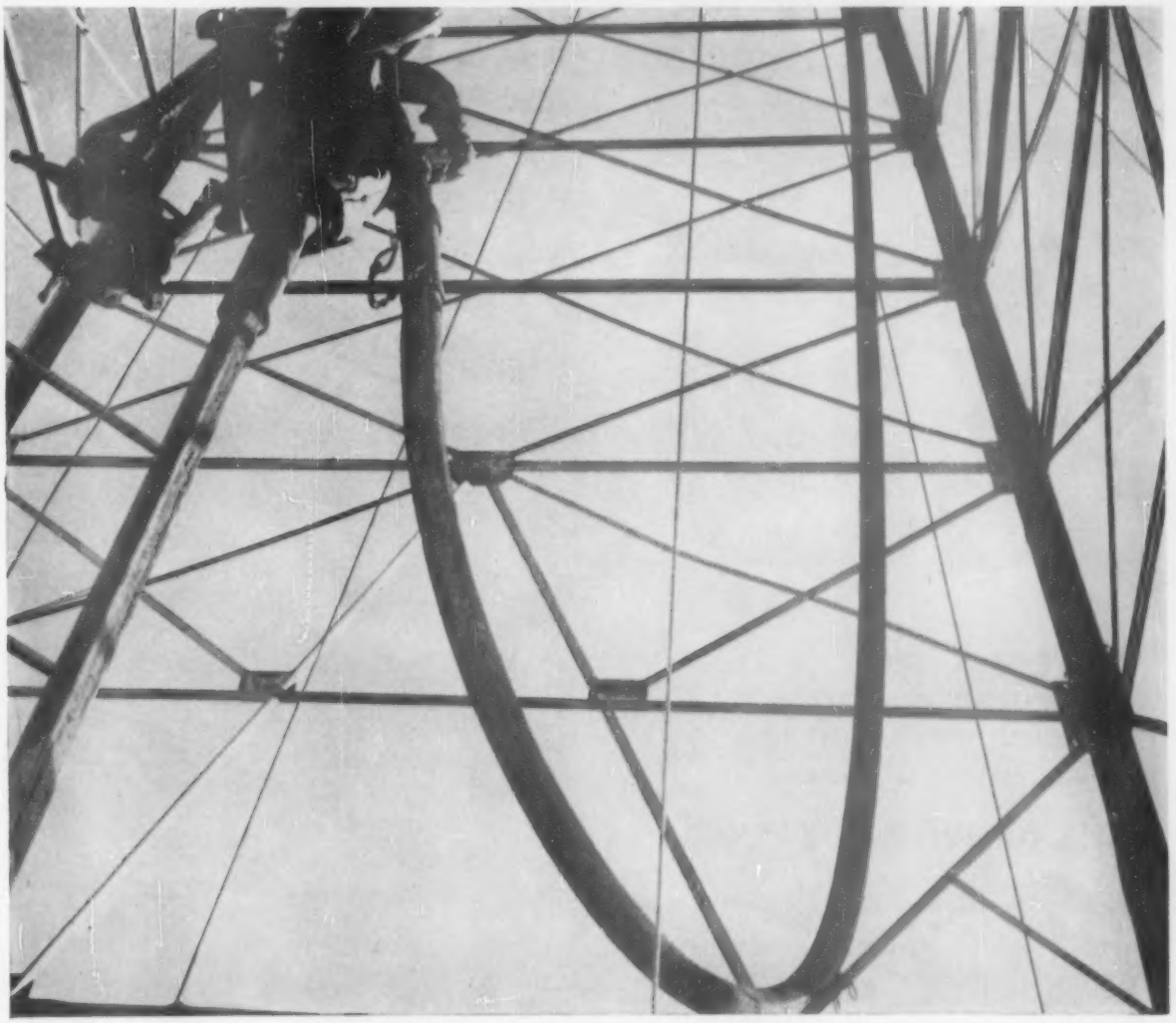
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



B. F. Goodrich hose stands extreme bottom hole pressure

THAT B. F. Goodrich hose has two layers of strong, steel reinforcement to take the high pressures of extreme bottom hole drilling. Yet with all this strength, Highflex rotary drilling hose is still the most flexible made for heavy-duty service.

Resistant to bursts, it qualifies for a Grade C (5000 lb. test pressure) American Petroleum Institute rating. Highflex recovers quickly from sudden shocks or impacts. Extra layers of wire and fabric on the hose ends protect against bending stress. Extra strength here means extra safety—no hose blowouts at the coupling.

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Thick, tough rubber cover resists gouges, scrapes and tears. Unaffected by sun, wind and rain. Oily mud will not cause swelling or rotting of the tube.

Leading supply stores carry Highflex rotary drilling hose. And here's something to remember. When emergencies make service the *first* consideration in buying hose, you can get the replacement you need any time of day or night at one of these B. F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Williston, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *The B. F. Goodrich Company, Dept. M-369, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

DID YOU EVER STOP TO THINK, THAT...

if you drive your car 80,000 miles and average 40 miles per hour, your engine has operated 2,000 hours?

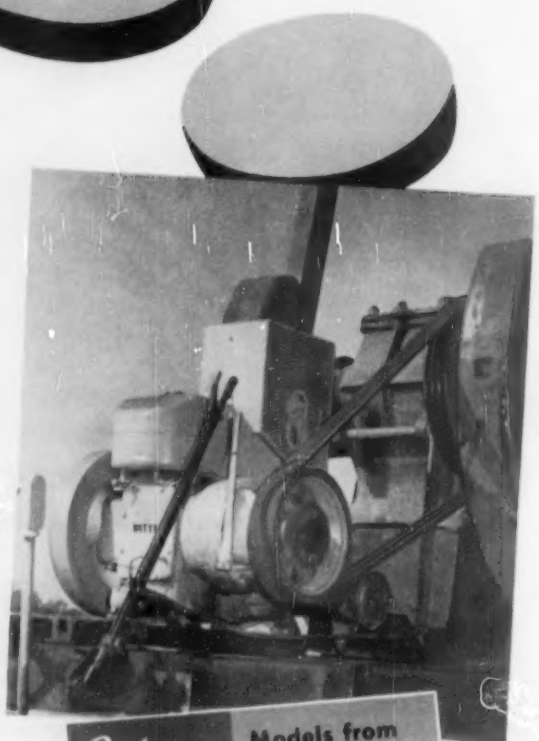
SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

YET, ON A WELL THAT PUMPS 24 HOURS PER DAY . . .

2,000 hours are put on the pumping engine in less than three months . . . and there are many Witte engines running today that have run the equivalent of three-million miles.

THE ANSWER IS DESIGN . . .

Your multi-cylinder automobile engine is a high-speed machine where the greatest amount of power must be packed into the smallest space with the least practicable weight, while the sturdy, slow-speed, single-cylinder Witte is designed primarily for long-lived, stationary service. Also, in a Witte single-cylinder engine there are fewer moving parts to require maintenance and repairs, with obvious advantages of easy serviceability and low maintenance cost. In the field, both cylinder liner and piston can be replaced and all moving parts easily serviced.



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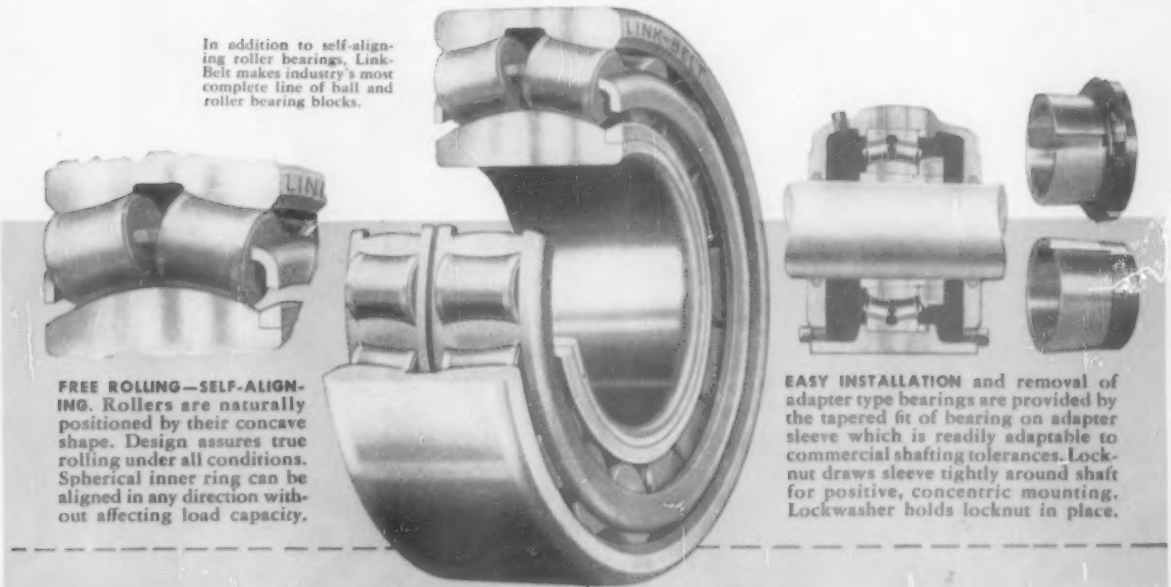
USS

UNITED STATES STEEL

For tough, heavy-duty applications...make use of these important

bearing differences

In addition to self-aligning roller bearings, Link-Belt makes industry's most complete line of ball and roller bearing blocks.

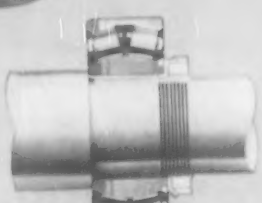


FREE ROLLING—SELF-ALIGNING. Rollers are naturally positioned by their concave shape. Design assures true rolling under all conditions. Spherical inner ring can be aligned in any direction without affecting load capacity.

EASY INSTALLATION and removal of adapter type bearings are provided by the tapered fit of bearing on adapter sleeve which is readily adaptable to commercial shafting tolerances. Locknut draws sleeve tightly around shaft for positive, concentric mounting. Lockwasher holds locknut in place.

LOCKED-IN CLEARANCE. Selective assembly of rollers and raceways with accurately formed hardened steel retainers assures proper operating clearance, guidance and spacing of rollers.

Rollers are completely pocketed in retainers for accurate spacing and guiding.



SMOOTH OPERATION, LONG LIFE are advantages of the straight bore type mounting, which assures maximum concentricity of inner ring with shaft. Especially desirable when minimum radial run-out is essential.

They're all present only in
LINK-BELT self-aligning roller bearings

SUBTLE differences in bearings can make notable differences in the life and efficiency of your equipment. Take Link-Belt self-aligning roller bearings, for example. Their "self-contained" feature permits the bearing to float axially in the mounting, when desired, compensating for shaft expansion or settling of bearing supports . . . preventing extraneous thrust loads from being set up between bearings on the same shaft. What's more, inherent self-aligning design and preadjustment preclude use of expensive or cumbersome self-aligning housings.

Ask your nearest Link-Belt office or authorized stock-carrying distributor for Book 2196 on self-aligning roller bearings and Book 2550, containing full data on all Link-Belt ball and roller bearings.

LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

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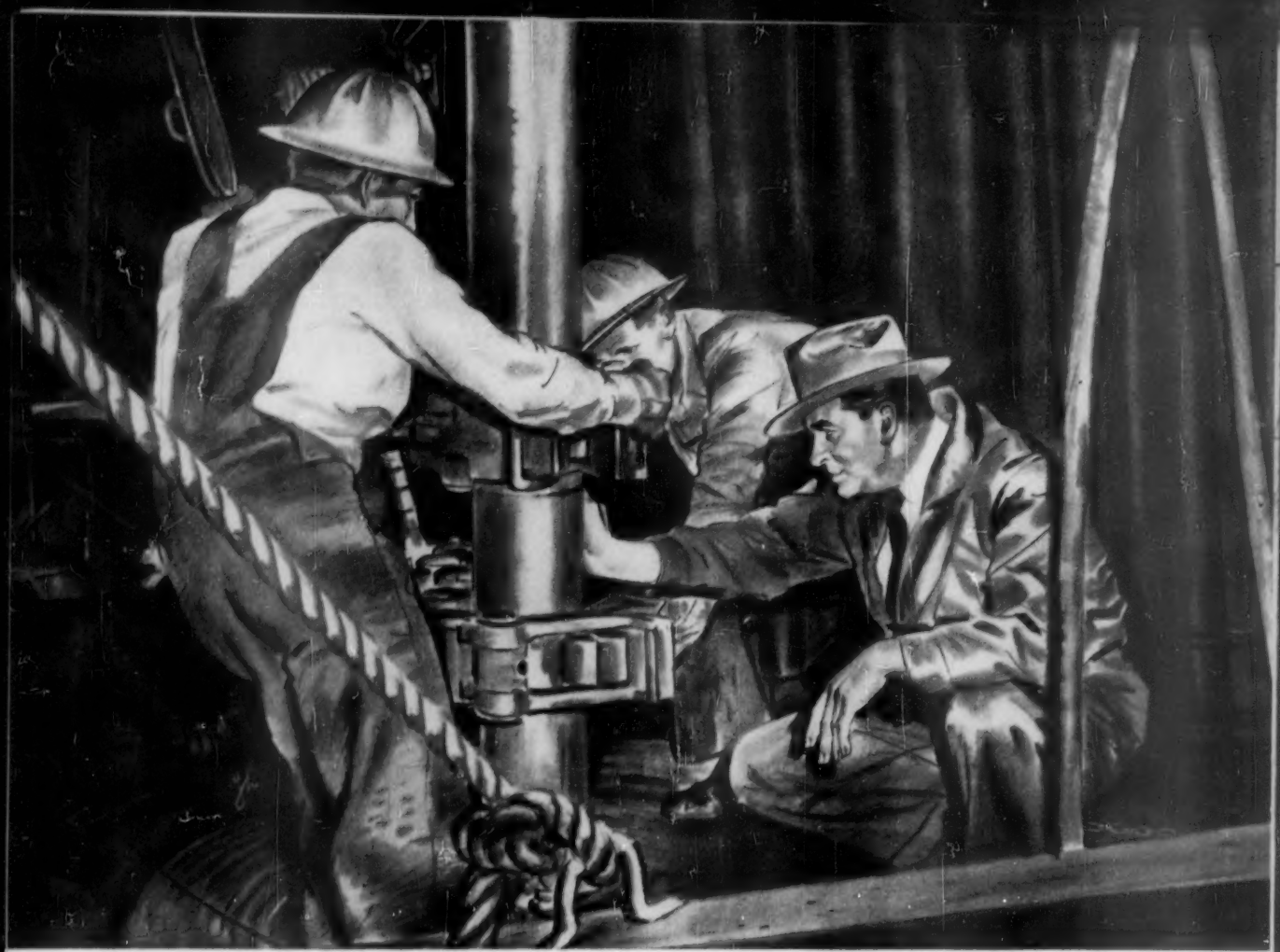

MR. INDEPENDENT knows the importance of follow-through on service since . . .

On A Rotary Rig, Every Minute Counts!

From the driller and tool pusher right on up, every oil man knows the importance of the race against time in drilling. Starting with the job design, through drilling practice, to completion of the hole . . . every element is figured to reach pay as quickly as possible to keep costs down.

This is one of the big reasons why oil men prefer to deal with independent distributors. They have enough problems on the rig during their daily tours, and enough headaches from meeting emergencies without having to worry about supplies. They know they can rely on their independent distributor to give them what they want, when and where they want it.

Here's why:

1. The independent knows the oil men he serves personally. He knows your problems and works along with you as a sort of friendly partner. Because of this, he is able to anticipate your requirements and have them on hand when needed.

For example, take the 19 independent distributors (listed at right), who handle Pittsburgh Seamless Oil Country Goods. If you need a string of drill pipe, casing or tubing, you can count on them to have it on hand when you need it and often on short notice.

2. When you buy from him, you know you are getting the best. Your independent selects his lines of equipment from a broad range of producers, so he is free to choose those suited for your requirements.

3. His service is fast and flexible. Your distributor makes a specialty of serving a small area well, rather than spreading out his efforts over the country. He offers 24-hour service on even the smallest items of equipment. He is on hand to meet emergencies.

What is equally important, he is able to make decisions and give you the right answers quickly because he is not bound by inflexible rules or remote control in handling your requirements. Often the store manager of one of the 141 stores of the independents listed, can handle supply problems directly that otherwise would mean red tape and delay.

4. You can be sure his price is right. Your independent works on low overhead and long experience. He is used to competition, and depends for his livelihood on being able to meet it. That's why independents are handling nearly 60 per cent of the equipment business in the oil fields today, compared to 15 per cent back in the twenties.

5. There is nothing impersonal about your independent distributor. He's a close friend of yours who has lived close by your operations for many long years, and keeps in constant touch. Because you know him, and he knows you, you can do business with him conveniently and with less paperwork. And remember this: The profit he makes from his business stays in your area.

6. In meeting your requirements, the independent distributor is backed by reputable producers with long experience and know-how in the manufacture of the equipment you use. He handles Pittsburgh Seamless, for example, because he knows Pittsburgh Steel Company has been producing for more than 50 years and has established a reputation for doing a good job.

Newly modernized and expanded mills have equipped Pittsburgh Steel to do a better job for you today than ever before, offering the same close personal service that has become the trademark of the independent. The next time you order seamless, why not get the pipe of your choice through the supplier of your choice? Always specify Pittsburgh Seamless!

For Fast, Personal Service

—these independent distributors who carry Pittsburgh Seamless drill pipe, oil well tubing, and casing are ready to meet your requirements.

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Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

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Charleston 22, West Virginia

Midland Supply Company
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Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
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Lake Charles, Louisiana

Norvell Wilder Supply Company
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Beaumont, Texas

Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 2752
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
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424 North Boulder Avenue
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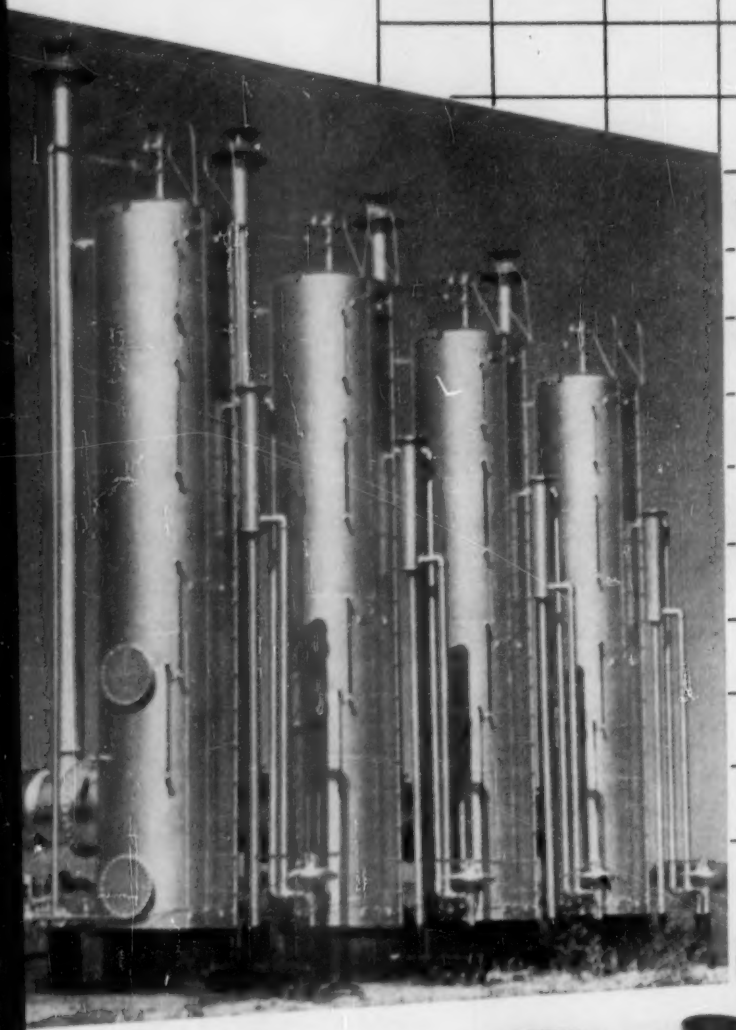
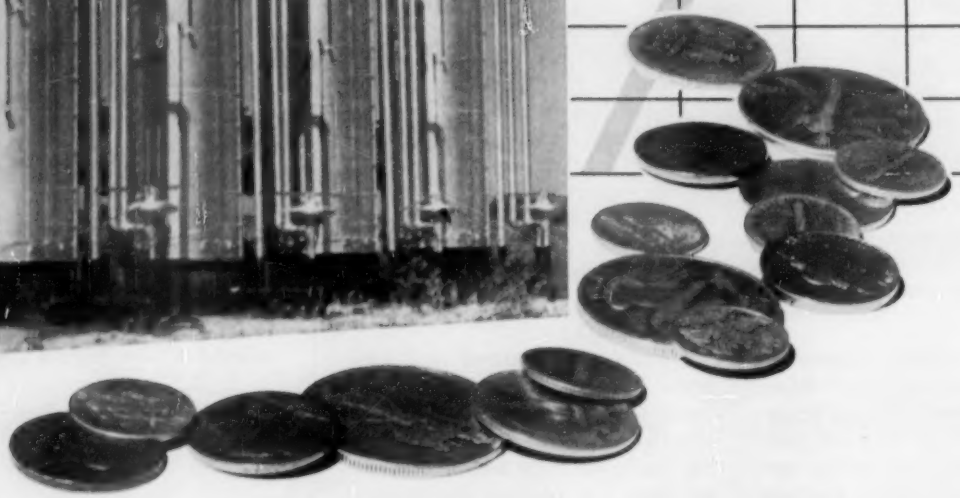


There's MORE for your money in PARKERSBURG Emulsion Treaters



• Parkersburg Emulsion Treaters are the deluxe type of the treater field. Like new model cars, they have all the "extras," but without the extra cost. They cost no more than comparative standard treaters of the same size.

With all of the extras of a deluxe model you get better emulsion and free water separation; more effective emulsion breakdown; more specific separation of emulsion into clean oil and water; greater maintenance of high gravity oil through conservation of lighter fractions.

Summing up, Parkersburg Treaters will handle a wider variety of treating problems with least auxiliary equipment. Size for size they will handle more fluid, do more heating, perform more efficiently and give you more for your money than you can get elsewhere.

Ask your Parkersburg Representative to outline all of the features of Parkersburg Emulsion Treaters.

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RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

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FORT WORTH, TEXAS

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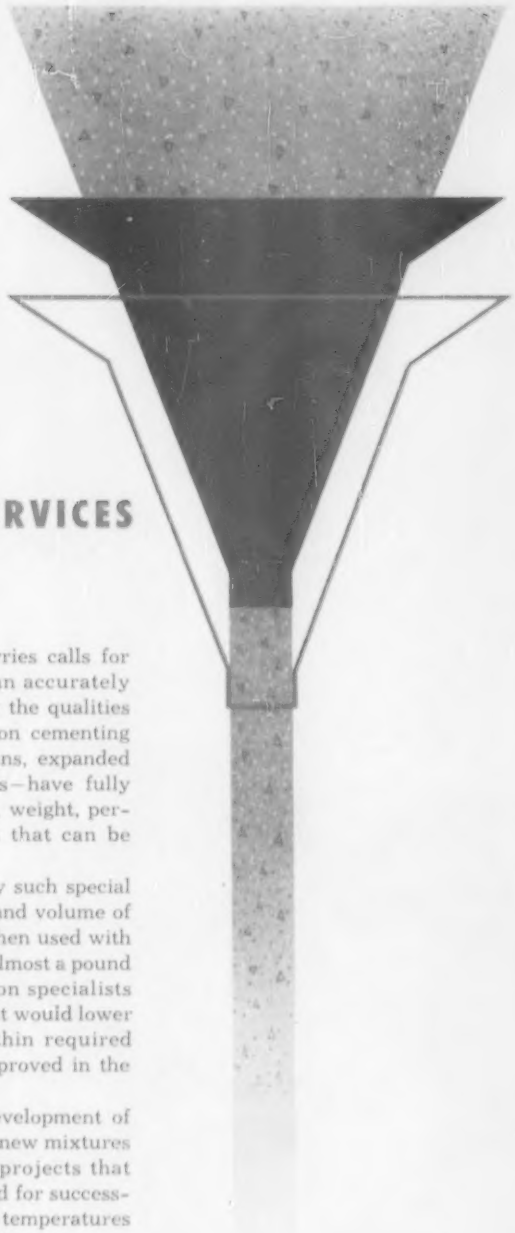
CUSTOM-MADE CEMENTS FOR PROTECTING PROBLEM WELLS



a modern technique of

HALLIBURTON CEMENTING SERVICES

Successful, first-time cementing with custom-made slurries calls for experienced engineers, chemists and geologists who can accurately determine what additives or materials will give a slurry the qualities that can give added protection to production. Halliburton cementing specialists—leaders in research on gel-cements, pozzolans, expanded perlites, cellulose flakes, dispersants and other admixes—have fully tested thousands of cements to learn the exact strength, weight, perforating qualities, volume and setting characteristics that can be expected for any individual job.

The value of custom-made cements has been shown by such special jobs as the one that required a slurry with the strength and volume of a 10% gel-cement. However, the weight of this slurry, when used with maximum water, is approximately 13 pounds per gallon—almost a pound heavier than the formation could withstand. Halliburton specialists determined that ½ cubic foot of perlites per sack of cement would lower slurry weight and still keep the cement strength within required limits. With this custom-made formula, which was first proved in the laboratory, the well was successfully cemented.

Halliburton's continuing research on cements—and development of accepted test tools and procedures—is producing entirely new mixtures that can meet all API specifications. Today, research projects that began years ago are paying off in special cements designed for successful, first-time cementing in depths of 2,000 to 20,000 feet, in temperatures from 60° F. to 400° F. and at pressures of 100 to 18,000 p.s.i.

More than one million individualized cementing jobs under all conditions—the unmatched record of Halliburton Cementing Services—has proved that *effective* cementing means *Halliburton* cementing! For the extra benefits that only research and experience can provide, call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

CEMENTING SERVICES

211 SERVICE CENTERS - JUST MINUTES AWAY FROM ANY RIG

Wire Rope at Work—Hard at it near Alice, Texas, the J. B. Vassey Drilling Company was working at 5600 ft when the photographer took this picture. It was a job on which excellent progress could be made with a 96-ft mast and other lightweight, streamlined equipment.

The rotary line was 1-in. 6 x 21 Seale—Form-Set (preformed) Bethlehem Purple Strand with independent wire rope core. To allow reserve for cutoffs, plenty of extra rope was kept on hand, and some of this you see on the reel in the foreground. Here, at the moderate depths involved, the 1-in. rope proved an excellent choice, easily handling the stand of drill pipe and other loads assigned to it.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

PETROLEUM • MINING • CONSTRUCTION • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

Sure, that old pump still works,

but how much does it cost to keep?

That rugged old pump of yours may not be the bargain that it seems. Let's do some arithmetic. If the efficiency of the old pump is 75% vs. the 85% efficiency of the new pump, you are paying more to keep it than you would to replace it. That's because a new unit of equivalent output uses less power. Thus it soon saves its own cost — then begins to pay dividends.

Let's take a specific example—a general service pump

Old pump efficiency 84%	**625 BHP**
New pump efficiency 89%	**590 BHP**
	35 BHP Saving

On the basis of 1¢ per KWH, the 35 BHP saving for a 5000-hour year (approximately 14 hours per day) amounts to $1300. This saving, capitalized in 4 years at 4% adds up to $5520. Yet the price of the new pump that saves $5520 is only $4054.

What would the pump replacement profit be in your particular case? Your De Laval representative can tell you exactly — in dollars and cents — as soon as he has the basic facts on your present installation. Call him in today or write to De Laval for Pump Fax Bulletin which includes a valuable "power-savings" chart.

DE LAVAL *Pumps*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL2170

IDECO

ONE OF THE DRESSER INDUSTRIES

RIGS AND PARTS*

RIG CAPACITIES

With 4½" Drill Pipe

A size and type for every depth — every job

16,000′ to 20,000′	Model 1350-S, 1600-2400 HP input; torque converter drive.
15,000′	Model PR-1350, 1400 HP input; mechanical or fluid coupling drive.
14,000′	Model PR-1050, 1400 HP input; mechanical or fluid coupling drive.
12,000′	Model SUPER 7-11, 1200 HP input; torque converter, fluid coupling, or mechanical drive.
10,500′	Model 7-11, 1050 HP input; torque converter drive.
8,000′	Models H-750 and M-750, 750 HP input; torque converter, mechanical or fluid coupling drive.
7,000′	Model H-525, 525 HP input; torque converter drive.
6,000′	Model H-40, 400 HP input; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.
5,000′	Model H-35, 350 HP input; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.
4,500′ and 3,300′	Models H-30 and H-25, 300 and 250 HP input; servicing depths 10,000′ and 9,000′; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.
2,500′	Model H-20-B, 200 HP input; servicing depths to 7,500′; torque converter drive; skid-mounted, or trailer-mounted as a Rambler Rig.
3,000′	Model PR-150, 150 HP input; mechanical drive, air controls.

FOR DETAILED DESCRIPTIONS, SPECIFICATIONS, AND PERFORMANCE CHARACTERISTICS, GET YOUR COPY OF CATALOG NO. 54 FROM ANY J&L MAN.

Many a driller has promised himself that his next rig will be an IDECO. There are two reasons for this industry-wide trend.

First, every man has a natural desire to own the finest equipment money will buy, and these rigs are world-famous.

Second, J&L maintains IDECO parts stocks at centrally located points, ready for immediate delivery to any field in the United States and Canada.

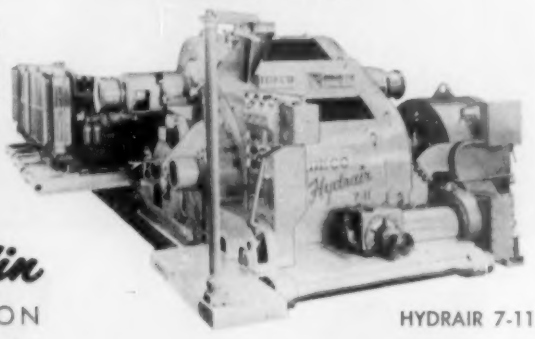
What is an IDECO HYDRAIR HOIST?

IDECO *Hydrair* hoists combine a *hydraulic* torque converter drive with *air* clutch and *air* controls

IDECO Power Rigs have a mechanical or fluid-coupling drive. However, like the Hydrair rig, there are air controls and air clutches. Mechanical drives are available with the PR-1350, PR-1050, SUPER 7-11, M-750 and PR-150.

*** Where J&L stocks IDECO Parts**

Casper, Wyoming
Great Bend, Kansas
Oklahoma City, Oklahoma
Shreveport, Louisiana
Corpus Christi, Texas
Wichita Falls, Texas
Houma, Louisiana
Hobbs, New Mexico
Edmonton, Canada



HYDRAIR 7-11

J&L STEEL

Jones & Laughlin STEEL CORPORATION

SUPPLY DIVISION — TULSA, OKLAHOMA

Serving The United States and Canada

109-M

Keep your slush pumps working . . .
Cutaway shows how Wildcat Sealing Rings are designed for highly efficient performance with low rod friction.

with new J-M WILDCAT Packing

A size for every slush pump

Pump make and model number right on package make it easy to choose the Wildcat packing size for your slush pump.

Johns-Manville Wildcat Packing has won wide acceptance among tool pushers and drilling contractors because it stands up longer than other packings. In rig after rig, Wildcat keeps slush pumps operating with less repacking, reduces critical downtime.

Wildcat (Cumpac® Style No. 239) is a custom-moulded, semi-automatic packing, made of tough, resilient compounds to withstand abrasives and corrosives in oil field operations. It reduces rod wear, seals tightly with minimum friction. Easily installed.

Ask for Wildcat at your regular supply house. It's stocked by field stores and supply houses in the Southwest area. For complete technical details ask Johns-Manville for Wildcat folder PK-77A. Write Box 60, New York 16; in Canada, 199 Bay Street, Toronto 1, Ontario.

Johns-Manville PACKINGS & GASKETS

Pratt and Whitney, division of United Aircraft Corporation, uses Rockwood-equipped fire truck to protect its private airport. FogFOAM here smothers test fire in seconds.

Leading fire truck users rely on Rockwood for protection

Where dependability counts — in fire protection of airports, industries, refineries and municipalities — you will find Rockwood on the job.

Fire trucks, for instance, get the benefit of such famous Rockwood fire-fighting equipment as WaterFOG, FogFOAM, FOAM and WET — each designed to conquer different types of fires. By means of Turret Nozzles, these trucks discharge large volumes of FogFOAM, FOAM or WaterFOG. By means of Ground Sweep Nozzles, they fight flowing gasoline fires and protect firefighters and trucks at the same time. By means of Hand Lines, they control fires in hard-to-get-at areas.

Rockwood is a pioneer and leader in the development of many unusual ways of engineering water to cut fire losses. If you are not familiar with these different firefighting weapons, you will find it well worth your while to send for the free booklet, "15 Types of Fire Protection." Just write Rockwood Sprinkler Company, 361 Harlow Street, Worcester 5, Mass.

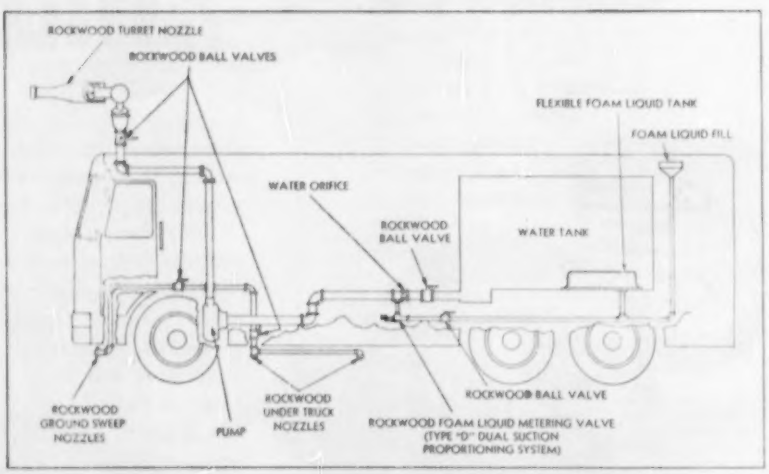
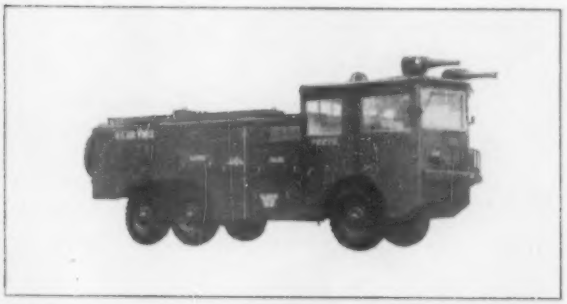


Diagram Shows How Rockwood FOAM is automatically mixed with water to form Rockwood FogFOAM in a fire truck. Note Rockwood Foam Liquid Metering Valve (Type "D" Dual Suction Proportioning System).

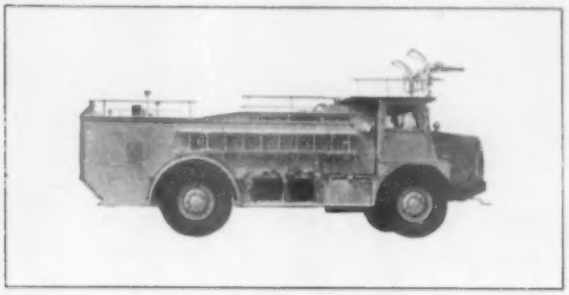
ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses



This U. S. Air Force Rockwood-equipped fire truck is the largest of its kind. Can be operated with pistol grip hydraulic controls from within cab, manual remote control from within cab or direct manual control from top of cab. Equipped with the latest types Rockwood combination FogFOAM Turrets and Nozzles and a Rockwood Automatic FOAM Proportioning System. Built by American LaFrance Foamite Corporation.

The Royal Canadian Navy uses this fire truck with a complete Rockwood FogFOAM system. The system consists of two manually operated combination FogFOAM Turrets and Nozzles, three Group Sweep Nozzles, two Under Truck Nozzles, two Hand Line Nozzles and an Automatic FOAM Proportioning System. Truck was built by Bickle Seagrave on a Walter Motor Company chassis.

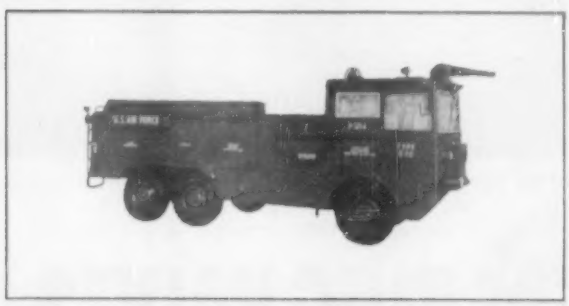


Washington, D. C., National Airport handles one of the heaviest traffic loads in the United States. It is protected by these large fire trucks, equipped with Rockwood FogFOAM systems and built by Maxim Motors Company on a Walter Chassis.

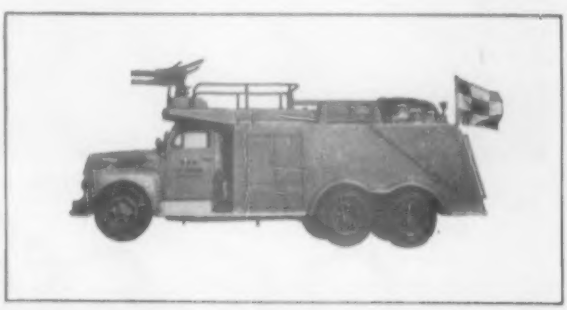
Glenn L. Martin Airport uses this Rockwood-equipped fire truck for efficient fire protection. The FogFOAM system in the truck was designed and manufactured by Rockwood. Truck was built by Maxim Motors Company on Walter Chassis.

Detroit Transmission Division, General Motors Corporation, reports "More fire fighting punch than any other small truck we have seen." It automatically discharges Rockwood FogFOAM or WET. Built by Young Fire Equipment Corp. on a G. M. chassis.

Dayton, Ohio, Airport relies on this Rockwood-equipped fire truck for protection against fire. It contains a complete Rockwood FogFOAM system. Truck was built by Maxim Motor Company with chassis by Walter Motor Company.

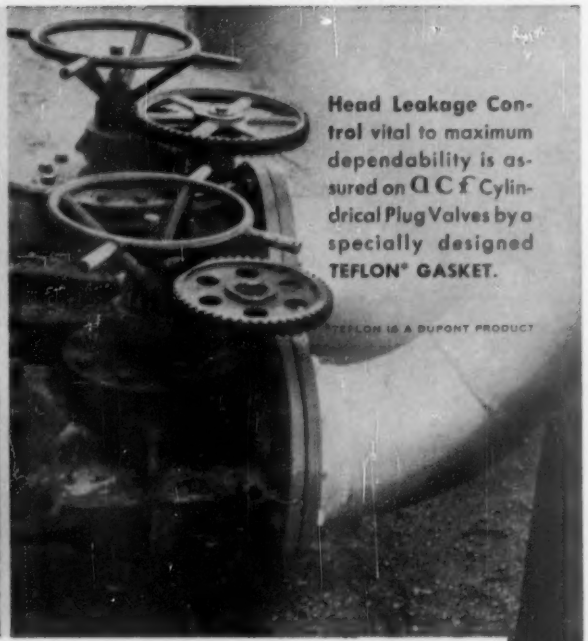


U. S. Air Force uses hundreds of Type 0-10 fire trucks equipped with complete Rockwood FogFOAM systems. These systems can be operated hydraulically or manually from within the cab or manually from the roof of the cab. They operate in temperatures as low as —60°F. Trucks are built by Marmon-Herrington Company.



McDonnell Aircraft Company in St. Louis, Missouri, protects its flying operations with this fire truck equipped with a Rockwood FogFOAM System. Note double Turret Nozzles, Ground Sweep Nozzles and Hand Line Nozzles. McDonnell is engaged in aircraft production for the U. S. Navy. Truck was built by Robinson Fire Truck Division.

Knife-edge Rotary Action of the acf Cylindrical Plug Valve clears obstructions, eliminates stoppages, insures constant flow.



Head Leakage Control vital to maximum dependability is assured on acf Cylindrical Plug Valves by a specially designed **TEFLON® GASKET.**

*TEFLON IS A DUPONT PRODUCT

QUALITY THAT PAYS OFF

Split-second Control Quick, quarter turn shut off on acf Cylindrical Plug Valves satisfies rigid control requirements in the petroleum, natural gas and processing industries.

Unobstructed Flow acf Cylindrical Plug Valves have a port opening the same area as the pipe itself.

Rectangular Port and Full Round Port

acf

Representatives in 50 Principal Cities

CYLINDRICAL FULL PIPE AREA

PLUG VALVES

Write for descriptive Catalog 5-OG to
acf Industries, Incorporated, Valve Division,
1501 E. Ferry Avenue, Detroit 11, Michigan.

FILLING IN OLD STORAGE PITS, or any big or little oil field job, is a profitable operation for contractor M. E. Lake with his INTERNATIONAL TD-18A crawler and hydraulic bulldozer on the job.

"We're Strangers to trouble with INTERNATIONALS"

Texas oil field contractor makes both the big and little jobs profitable with INTERNATIONAL TD-14A and TD-18A crawlers

M. E. Lake, oil field contractor from Corsicana, Texas, starts all jobs—big and little—knowing that he has the power it takes to finish them quickly and enter them in the profit side of the ledger.

He uses an INTERNATIONAL TD-18A and TD-14A equipped with hydraulic bulldozers to handle his contracts, and here's what he reports:

"We're strangers to trouble with our INTERNATIONAL *crawlers. All jobs, big or little, are profitable with this equipment. They have the durable power that gets the jobs completed ahead of schedule and they operate so efficiently even the small jobs are money-makers."*

See what M. E. Lake is talking about at your own INTERNATIONAL demonstration. Your INTERNATIONAL Industrial Power Distributor will put any INTERNATIONAL equipment combination you name to work on your job at your convenience. Call him today.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

"SPEED AND THE POWER *are the things I like best about this* INTERNATIONAL *TD-18A and dozer,"* says operator F. D. Hawkins. *"That's what we need to get the big, tough jobs finished in a hurry."*

INTERNATIONAL HARVESTER

INTERNATIONAL®
INDUSTRIAL POWER
MAKES EVERY LOAD A PAYLOAD

HERE'S WHAT WE MEAN BY

Versatility!

Don't let the compact size and portability of Johnson Sea-Horses fool you. These dependable powerhouses perform man-sized jobs. We've seen them power a 30-foot oil barge, a truck-carrying freighter, a dredge.

On the other side of the scale, they drive speedy water "jeeps," utility boats, rafts and even logs.

But Johnson versatility goes much farther. With these motors you can beach your boat anywhere—maneuver like a water bug—slide through shallow and obstructed waters.

Want to change the power plant from one boat to another? It's a snap! Need service? Lift it off the boat and tote it to your Johnson Dealer nearby.

Sea-Horses are economical. No installation cost. You also save money on operation, maintenance and service.

To all this add Johnson's famous Dependability and you know why Sea-Horses are so popular among commercial boat operators. See your Johnson Dealer. Look for his name under "Outboard Motors" in your classified phone book.

FREE: Big new catalog on the five great Sea-Horses for 1955—from 3 hp* to 25 hp*. Read about the revolutionary new QUIET Sea-Horses—including the Electric Starting Sea-Horse 25. Write for your copy today!

JOHNSON MOTORS
6600 Pershing Road, Waukegan, Illinois
A DIVISION OF OUTBOARD MARINE & MANUFACTURING COMPANY

In Canada: Mfd. by Johnson Motors, Peterborough

Johnson
SEA-HORSES
FOR DEPENDABILITY

NEW QUIET
JOHNSON SEA-HORSE 10
$310.00 f.o.b. factory

10 hp: One of the 5 Versatile Sea-Horses for 1955

*OBC Certified brake horsepower at 4000 rpm.

A radio network speeds the service in Wyoming!

Downtime for lack of a repair part or vital operating supplies is costly anywhere and anytime. And if you're drilling 80 miles or more from the nearest telephone to service, you're really in trouble.

This was the situation in the rugged, barren area out beyond Casper and Newcastle, Wyoming. So National Supply—in keeping with its policy of supply service tailored to meet local needs—set up a mobile radio system to speed service to the drillers. A 250-watt transmitter 8,600 feet up in Casper Mountain and 50-watters in Casper City and Newcastle link seven two-way radio cars and National headquarters in Casper. Now National Supply field representatives anywhere within 300 miles can report the drillers' needs—or their own—instantly.

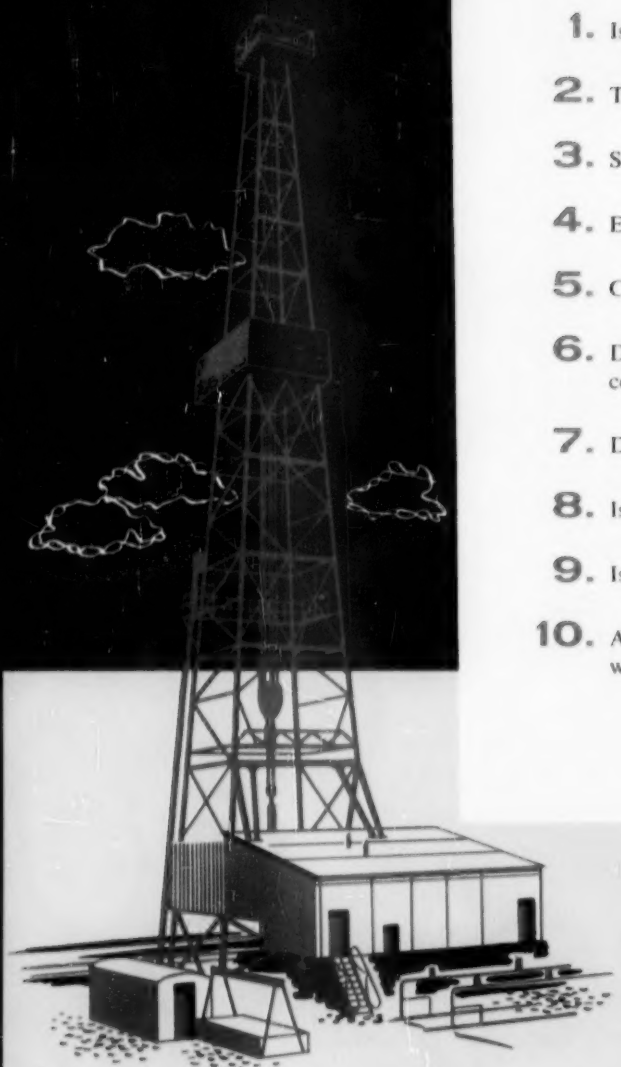
For over sixty years, oil men have been accustomed to exceptional service from National Supply stores in the far away desolate regions where they often have to go for oil. Although National is using two-way radio only in this rugged Casper area, the drillers probably aren't surprised that we've taken to it. Because, whether they're concerned about service or equipment that helps them to do a better job, users have come to expect something extra from National Supply.

First in quality...
First in supply service
in oil country everywhere

THE
NATIONAL SUPPLY
COMPANY

10 questions to ask BEFORE you specify casing!

1. Is it precision-made?
2. Thoroughly field-tested?
3. Streamlined for maximum running efficiency?
4. Easy to handle?
5. Can it be re-run repeatedly?
6. Does it have a minimum number of threaded connections?
7. Does it have high joint strength?
8. Is it 100% leak-resistant?
9. Is joint highly resistant to damage?
10. Available in different grades for varying well conditions?



...and for a YES answer to every one, SPECIFY

SPANG®

EXTREME LINE* CASING

available in these grades for every well condition

GRADE **J-55**	55,000 PSI MINIMUM YIELD STRENGTH
GRADE **N-80**	80,000 PSI MINIMUM YIELD STRENGTH
GRADE **P-110**	110,000 PSI MINIMUM YIELD STRENGTH

Your National Supply Representative will be glad to answer in detail these and any other questions you may have. See him soon!

THE NATIONAL SUPPLY COMPANY

SPANG-CHALFANT DIVISION
MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE • SUPERIOR AND ATLAS ENGINES

See the next page for information on other important Spang tubular products...

...and 10 facts to consider when you specify tubing

SPANGSEAL®
TUBING

1. Has 50% less connections
2. Provides 100% resistance to leakage
3. Provides more hole clearance
4. Eliminates "hanging-up" while running

SPANG®
EXTREME LINE®
TUBING

1. Provides maximum running speed; fast joint make-up
2. Has 100% joint strength
3. Provides 100% resistance to leakage
4. Has 50% less connections
5. Provides positive shoulder contact engagement
6. Has a streamlined exterior

For maximum corrosion resistance, you can specify a multiple coat, baked phenolic plastic coating applied at the mill on Spang tubing, drill pipe and line pipe. Ask the National Supply Representative about this Spang service—and any other information you'd like to have about this quality tubing.

THE NATIONAL SUPPLY COMPANY

SPANG-CHALFANT DIVISION

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.

DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE • SUPERIOR AND ATLAS ENGINES

The tank car of tomorrow...
in production today!

acf BUILT DURADOME

Pressure tank car with new all-welded insulation jacket . . . new flued dome nozzle . . . new standardized underframe. One of many types of DURADOME tank cars.

Whatever your shipping requirements are you'll find a DURADOME tank car for your purpose. All DURADOME cars, regardless of type, use, or capacity combine *four advanced features* which make this the most revolutionary development in the tank car industry in the past 15 years!

✓ A million-dollar press actually *flues* the dome base out of the heavy center section—providing greater strength and safety . . . smooth interior surface.

✓ Superior pressure-type construction (complete ring sections) means heavier steel *all* the way around for greater durability and protection for costly ladings.

✓ Standardized all-welded underframe provides flexibility of use with tanks of all standard types and capacities . . . more economical maintenance.

✓ All-welded jacket for insulated cars—of heavier guage steel, with one-piece ellipsoidal head. Streamlined . . . more weatherproof . . . needs less maintenance.

DURADOME tank cars are available in all standard types and capacities . . . for sale or lease through . . .

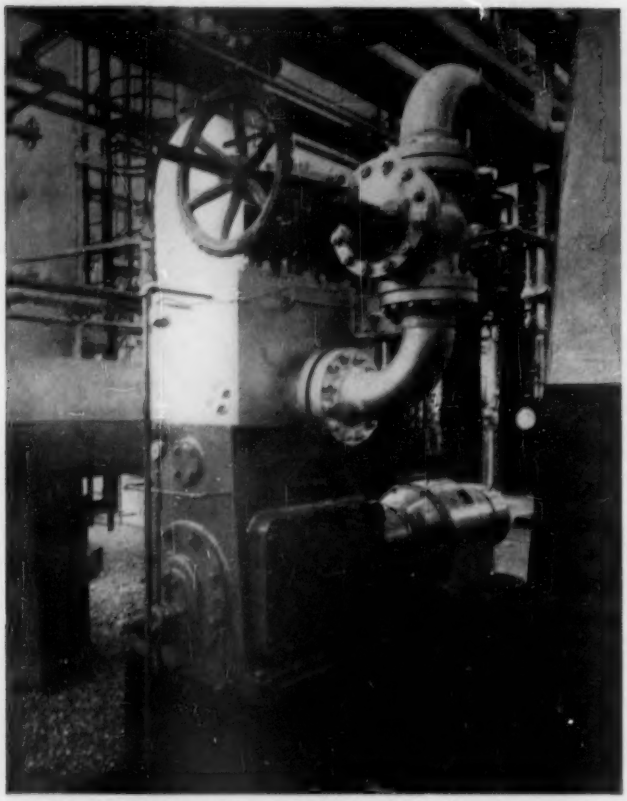
SHIPPERS' CAR LINE — S H P X

SHIPPERS' CAR LINE CORPORATION

30 Church Street, New York 7, N. Y.

A subsidiary of acf INDUSTRIES Incorporated

CHICAGO, ILL. • HOUSTON, TEX. • SAN FRANCISCO, CAL. • MILTON, PA. • EAST ST. LOUIS, ILL. • SMACKOVER, ARK. • TULSA, OKLA. • NORTH KANSAS CITY, MO.



WORTHINGTON POWER PUMP handles light hydrocarbons at Indiana refinery. Close-clearance liquid end makes this pump a natural for handling propane, butane, and other volatile fluids.

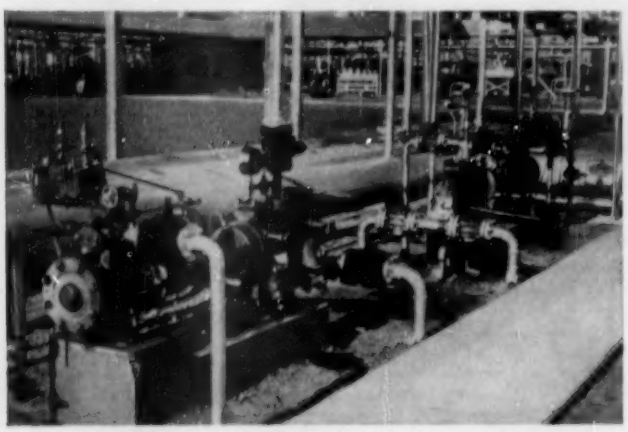
Power pump?
Steam pump?
Rotary pump?

You name it . . . we make it!

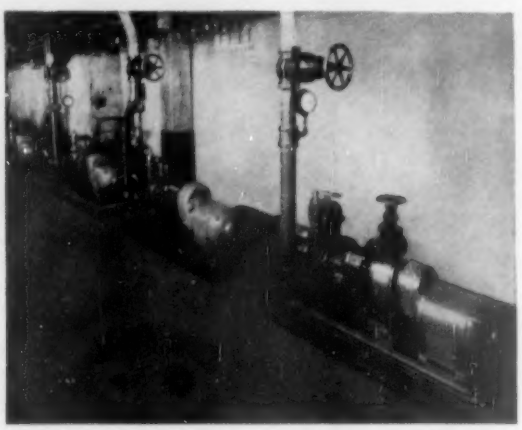
• When you're in the market for a pump, it stands to reason that you'll do better by going to a pump specialist. And that's exactly what Worthington has been since 1840.

Because we make all types of pumps—in thousands of different sizes—we're able to give an unbiased, objective opinion about any and all of your pump needs. No matter what your pressure requirements or type of power available, there's a Worthington pump that will suit your application exactly.

Write and tell us about your pumping problems. Be sure to give all pertinent details. Drop a line to your nearest Worthington district office or write directly to Worthington Corporation, Reciprocating Pump Division, Section P.3.2, Harrison, New Jersey. P.3.2



WORTHINGTON STEAM PUMPS pick up condensate from scrubbers for this petroleum company in Oklahoma. These units are part of Worthington's HiVol line—pumps specially designed to handle highly volatile liquids with high volumetric efficiency.



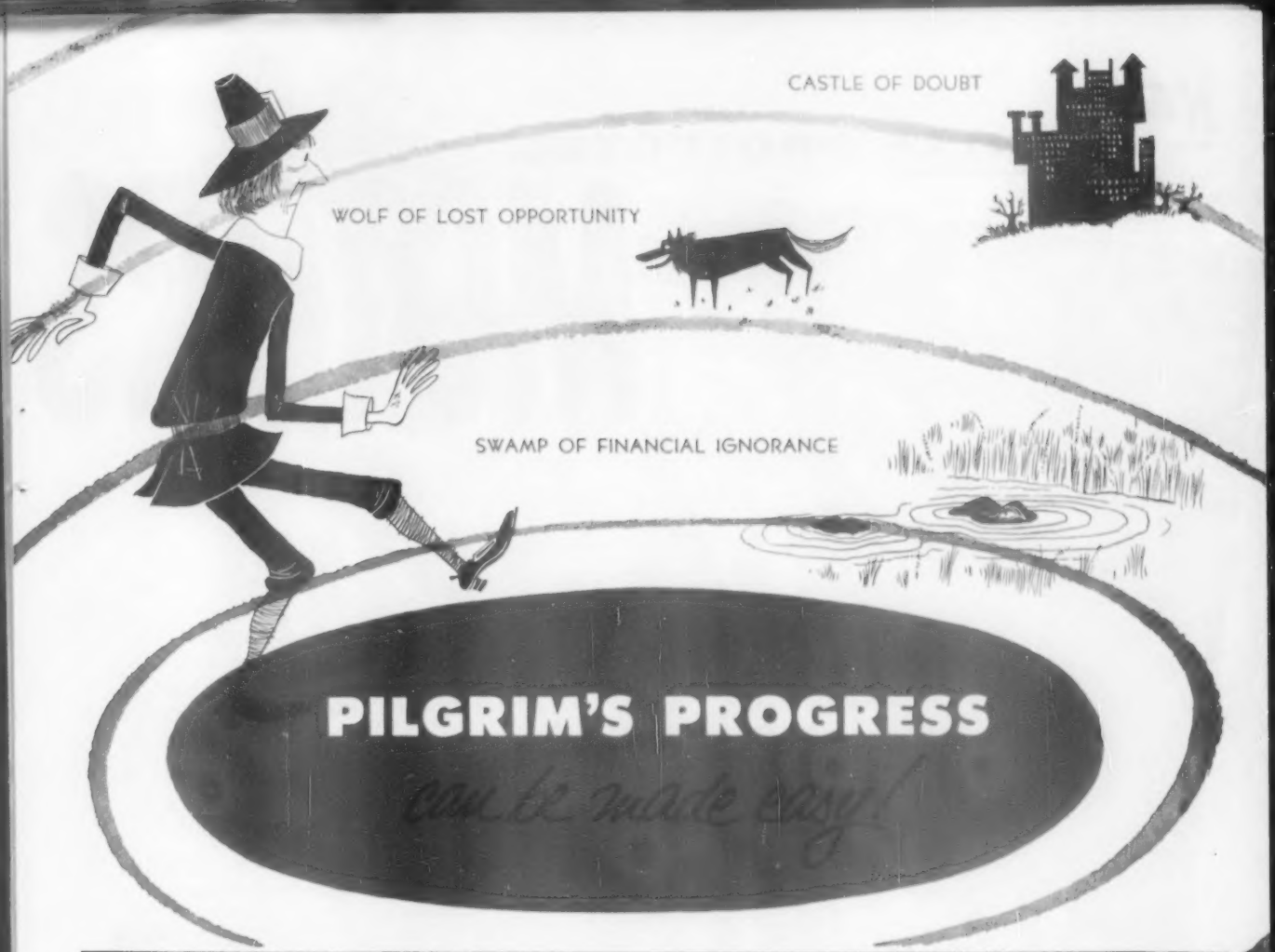
WORTHINGTON ROTARY PUMPS at this oil company plant in Pennsylvania are used for filling cans with motor oil of various viscosities. Every Worthington rotary pump is completely tested on oil before being put in stock.

SEE the Worthington Corporation Exhibit in New York City. A lively informative display of product developments for industry, business and the home. Park Avenue and 41st Street.

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

Centrifugal • Rotary • Steam • Power • Vertical Turbine



PILGRIM'S PROGRESS

can be made easy!

The progress of your business depends on your ability to plan ahead — to plan for future, orderly growth. The proved experience of officers of The National Bank of Commerce can help you in making these plans. And they can help you to keep your business running smoothly. The National Bank of Commerce has every modern banking facility available for its industrial depositors. You can put these complete services to work for you when you make The National Bank of Commerce of Houston your bank.

THE NATIONAL BANK OF COMMERCE

OF HOUSTON

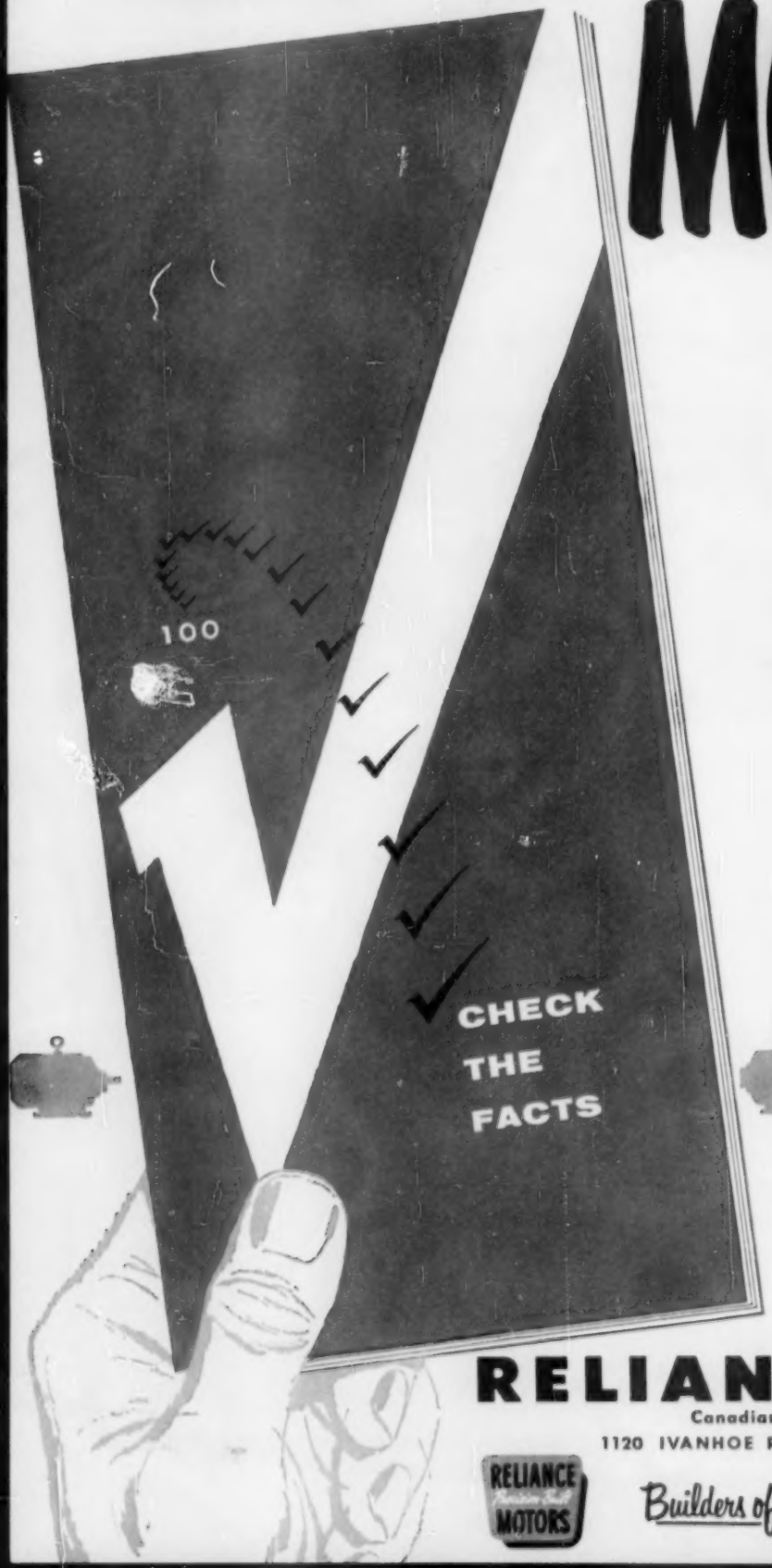
Gulf Building, Houston, Texas "The Bank for All the People"

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

NEW

TOTALLY PROTECTED A-C.

MOTORS



Yes, it's true!

Industry everywhere is checking into the facts about these amazing new *Totally* Protected A-c. Motors by Reliance.

To help *you* check the facts to see where it fits into *your* production area, we've prepared a booklet called "Check the Facts".

Get your copy today—by mail, or through your local Reliance district sales office or distributor.

B-1488

RELIANCE ELECTRIC AND ENGINEERING CO.

Canadian Division: Welland, Ontario

1120 IVANHOE ROAD • CLEVELAND 10, OHIO

RELIANCE MOTORS

Builders of the Tools of Automation

RELIANCE V•S DRIVE

STOP RUST!

with

RUST-OLEUM®

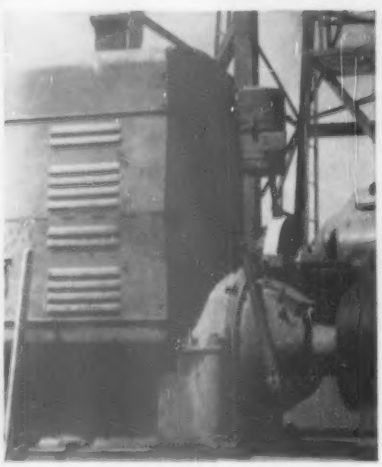
and match original equipment

COLORS

Resists Salt Air, Salt Water, Sun, Heat, Fumes, Blowing Dust and Sand—Yet Dries Quickly and Hard to a High Gloss Finish!

Do the job right in the field—right over the sound rusted surface! Just scrape and wirebrush to remove rust scale and loose rust — then brush or spray Rust-Oleum 769 Damp-Proof Red Primer (or H-50 Primer) over the remaining rust. Then—follow-up with the Rust-Oleum finish coat to match the original manufacturer's colors. That's all there is to it. Applied over rust—Rust-Oleum keeps your equipment looking better . . . LONGER!

Rust-Oleum is *exclusive*, incorporating a specially-processed fish oil base that penetrates rust to bare metal. It dries right, is free of objectionable odor, is ready-mixed and self-leveling. Specify genuine Rust-Oleum. Accept no substitutes. Many leading industrial oil field supply distributors carry complete stocks for your convenience.



FOR FREE TEST SAMPLE—ATTACH TO YOUR LETTERHEAD AND MAIL TO: RUST-OLEUM CORPORATION 2541 OAKTON ST., EVANSTON, ILL.

Please Send Me a FREE TEST SAMPLE to Match the Following Color: (check sample desired)

- ☐ Test Sample of 769 Primer to be applied directly over rusted surface
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- ☐ Test Sample of NEW NATIONAL BLUE
- ☐ Test Sample of NEW UNIT RIG GRAY
- ☐ Test Sample of NEW EMSCO GREEN
- ☐ Test Sample of BETHLEHEM YELLOW
- ☐ Test Sample of WAUKESHA GRAY
- ☐ Test Sample of OIL WELL ORANGE
- ☐ Test Sample of OLD EMSCO GREEN
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750 HORSEPOWER at 60 RPM. Weight 36,377 lbs.

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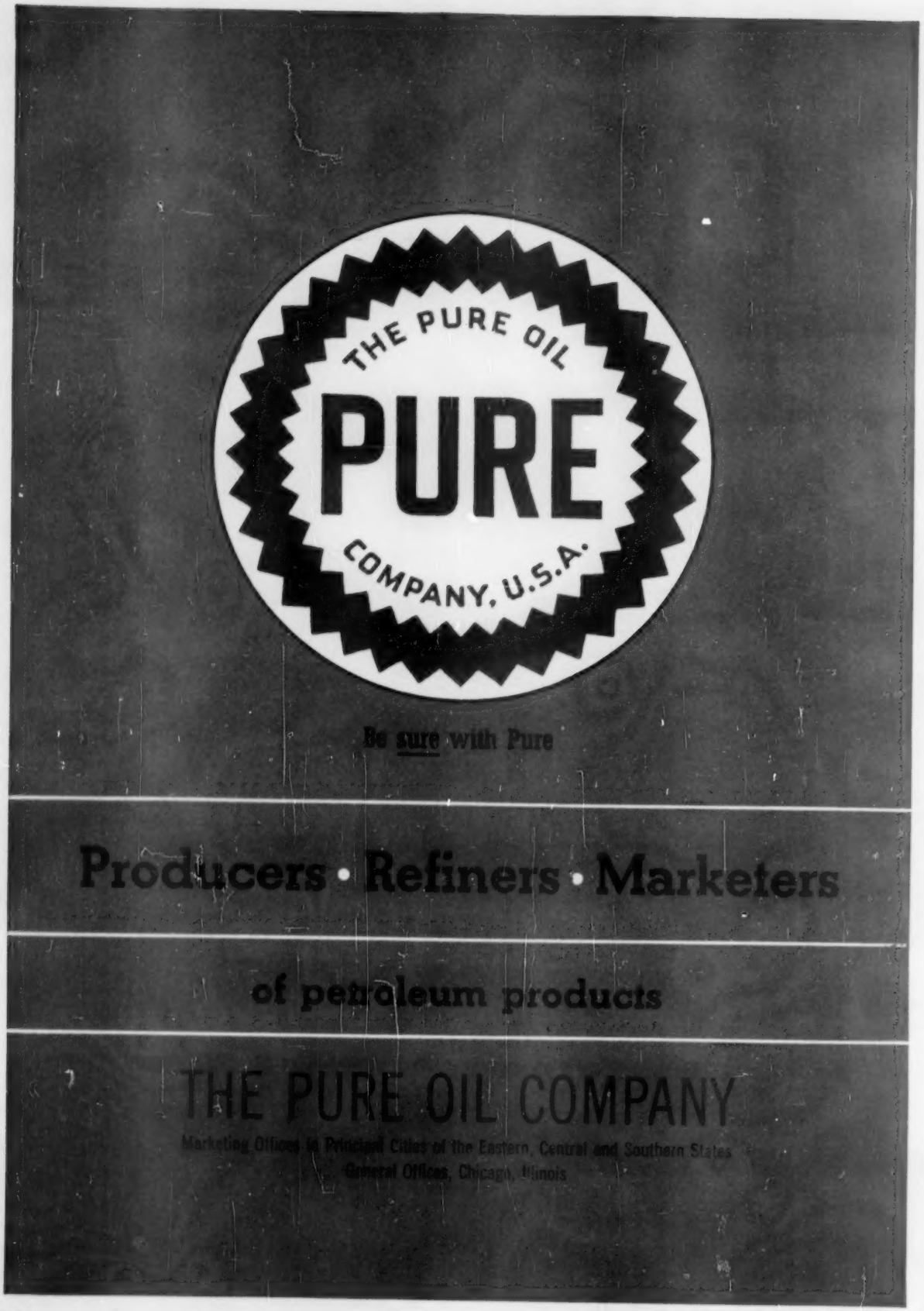
EXPORT DISTRIBUTOR: Lucey Export Corporation, 233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.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More and more, leading oil companies and independent oil exploration consultants are using the "Royal Scintillator" to investigate the radioactive "halos" surrounding oil fields. The number of favorable field reports on this technique are increasing daily.

We agree that not enough data is available as yet, however, there is a growing body of opinion which holds that this is a valuable oil exploration aid. Following are excerpts from letters* we have received indicating what some of the leading firms in the country say about our instruments.

"I have used this scintillator extensively prospecting for oil and am amazed at how easily oil trends are defined."—F.V., Salina, Kansas.

"We have made surveys in approximately 30 areas in Kansas, Oklahoma, and Texas. Of 13 drilled, 5 were accurately predicted. The other 8 were in error due to insufficient basic data."—A.B., Ft. Worth, Texas.

"We use Precision Radiation Instruments exclusively having found them the most accurate and constant. Using what we feel is the finest instrument available along with approved geophysical and geological techniques we are able to meet the exacting requirements of our broadening exploratory efforts." R.E.P., Dallas, Texas.

"I purchased a Precision instrument particularly to investigate this radiation pattern. As a member of the AAPG & SEG, I feel qualified to state that your instrument more than justifies your claims both as to the instrument and what it will do when properly used."—L.W.J., Edmond, Oklahoma.

We cannot guarantee that the Model 118 "Royal Scintillator" will locate oil, but we can guarantee that the "Royal" is the best instrument made for investigating the radiation pattern existing around oil fields. It is also the best instrument made for Uranium prospecting, and its use for this purpose should not be overlooked by oil geologists.

For full information contact your nearest dealer or write direct for our free phamphlet on "The Principles of Oil Field Detection with Scintillation Counters" and our complete catalog on Geiger Counters and Scintillators.

*Originals of these letters are on file at our office.

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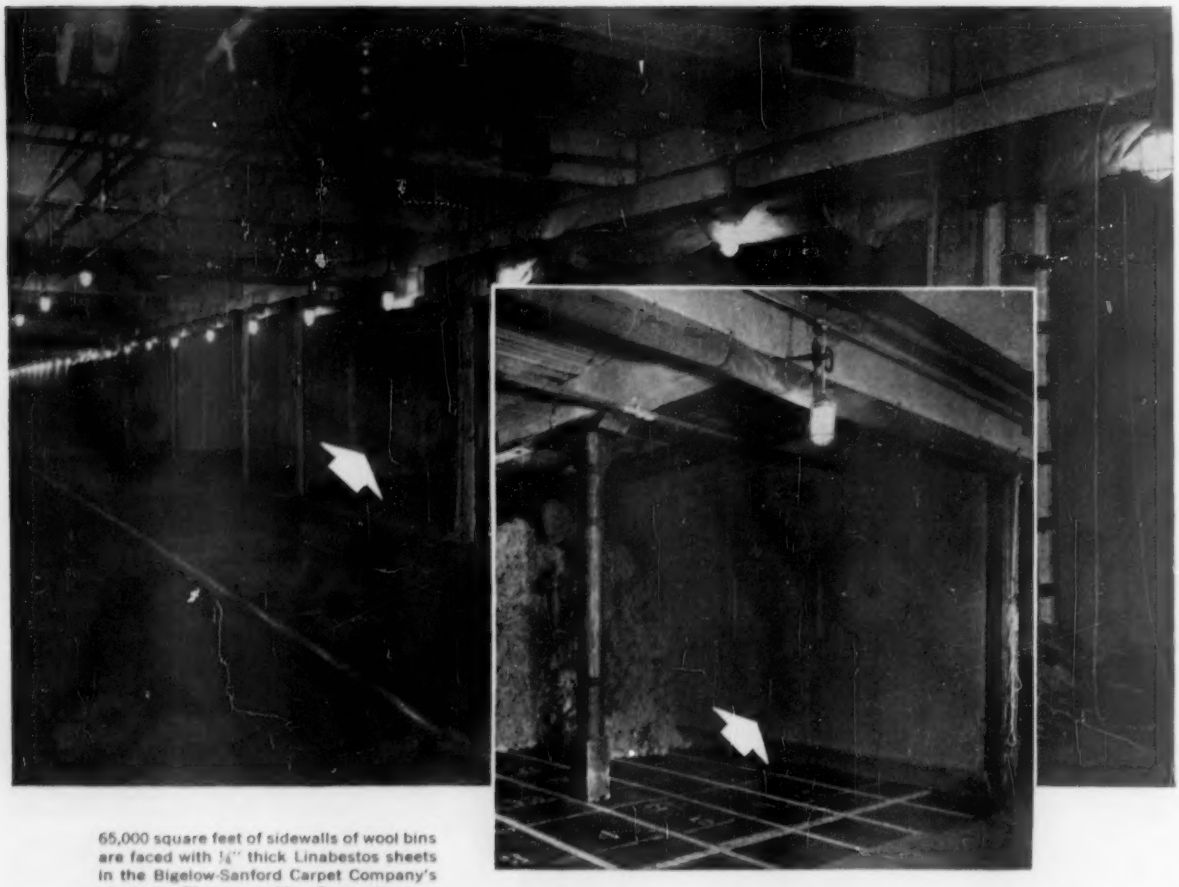

65,000 square feet of sidewalls of wool bins are faced with ¼" thick Linabestos sheets in the Bigelow-Sanford Carpet Company's plant in Thompsonville, Connecticut, a portion of which you see here.

Where strong, fire-resistant walls are needed choose K&M "CENTURY" asbestos-cement sheets

There's sound reason why Bigelow-Sanford Carpet Company used K&M's "Century" Linabestos. And the need for strong, fire-resistant walls was a chief determining factor.

"Century" Linabestos offers other important advantages . . . permanent protection against attacks by rats, termites and destructive insects.

Available in three different thicknesses (⅜", ¼", or 5/16"), Linabestos goes on fast, can be cut or drilled on the job and eliminates the need for lath and plaster. Sheets are available in two sizes: 48" x 48", and 48" x 96".

K&M makes two other kinds of flat asbestos-cement sheets . . . "Century" Apac and "Century" Sheetflextos. Apac is known for its low cost and remarkable adaptability while Sheetflextos, with flexibility as a chief characteristic, is used primarily on interiors. For full information on all three of these outstanding flat asbestos-cement sheets, write today.

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K&M Best in asbestos

INTERNATIONAL Model RF-190 6-wheeler, with special equipment for oil field work. GVW rating, 30,000 lbs. Wheelbases, 139 to 211 inches. Available with gasoline, LPG, or diesel fuel system.

NEW 6-WHEELER

with cost-cutting ruggedness

This new INTERNATIONAL 60,000-pound GVW 6-wheeler has what it takes for rugged oil field hauling. It's built to absorb severe loading shocks—with ability to transport heavy equipment over-the-road at maximum safe speeds.

In this model RF-230 you'll find the all-new INTERNATIONAL 212-hp. Royal Red Diamond 501 engine which delivers 444 lb-ft torque at 1600 rpm. And there are other features of extra value including hydraulic full-power steering, 12-volt electrical system. Engine and all components are precisely coordinated to assure maximum operating economy, minimum maintenance and long life.

This newest INTERNATIONAL is Tough-Job engineered like all INTERNATIONALS—has a surpassing measure of the performance, strength and stamina qualities that have made INTERNATIONAL the 6-wheel sales leader for 20 straight years. One of 92 6-wheel models for every 6-wheel job. Get full facts from your INTERNATIONAL Dealer or Branch.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

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GVW rating, 60,000 lbs.

Engine, INTERNATIONAL Royal Red Diamond 501, 4½-inch bore, 5¼-inch stroke, 501-cu.-in. displacement. Max. hp., 212 at 3000 rpm. Max. torque, 444 lb-ft at 1600 rpm.

Frame, double, heat-treated alloy steel. Two 15,000 lb. capacity front tow hooks, standard.

Clutch, 15-inch single plate with vibration damper.

Transmission, direct-in-fifth; auxiliary transmission available.

Standard equipment includes hydraulic, full-power steering, air brakes, 12-volt electrical system, 60-gallon right-side step-type fuel tank.

Optional equipment includes Comfo-Vision Space Saver cab for maximum front axle loading; high altitude engine equipment; tinted safety glass all around.

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HAS TYPE 316 STAINLESS STEEL SYSTEM TO WITHSTAND CORROSIVE CONDITIONS

High resistance to corrosion and sustained high accuracy are combined in this new heavy-duty Ashcroft Gauge. The 2½" dial size makes this compact instrument ideal for small tanks and processing equipment where large pressure gauges would be impractical. Bourdon tube (welded at socket and tip) . . . square shank and ¼" male N.P.T. bottom connection . . . geared movement—the entire gauge system is Type 316 stainless steel.

Made in standard graduations from 30 psi through 1,000 psi, this new Ashcroft Pressure Gauge has a black dial with easy-to-read white figures. The drawn steel case and threaded ring are finished in black. Pointer is precision needle type. Every part is designed, tested and manufactured to meet rigid service conditions.

YOUR INDUSTRIAL SUPPLY DISTRIBUTOR now has this new Ashcroft Gauge in stock. Let him know your requirements. You can depend on him for experienced counsel and prompt delivery.

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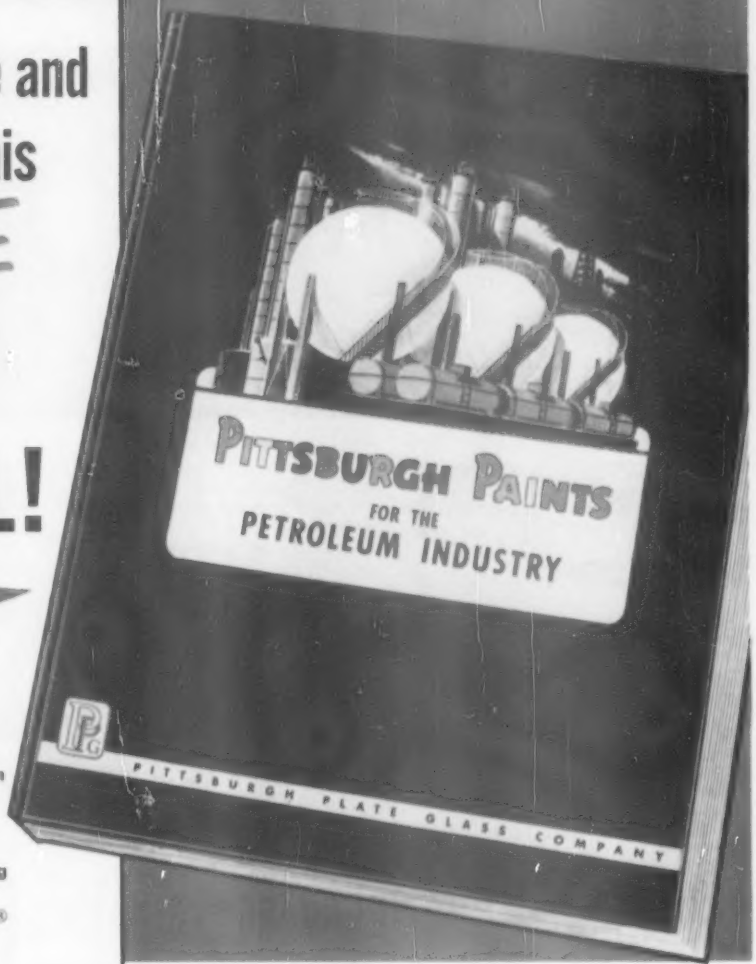

Contents Include:

1. **Product description.**
2. **Application recommendations.**
3. **Large-size color chips.**
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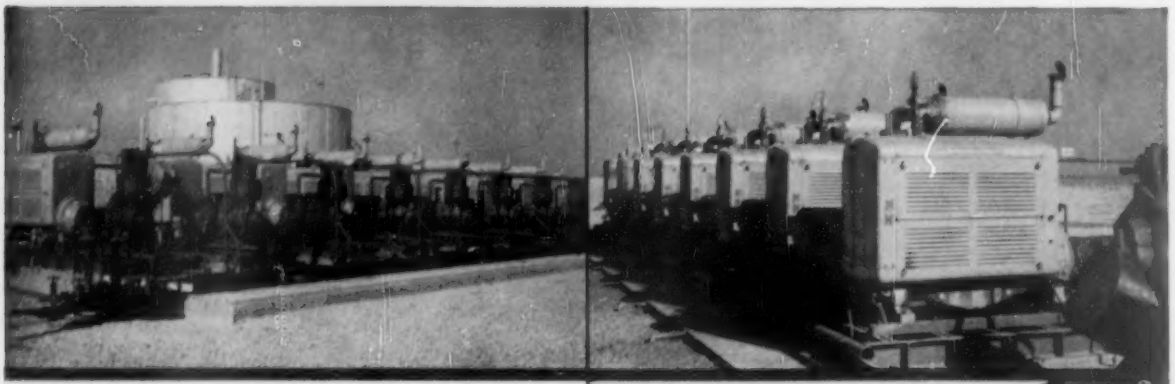
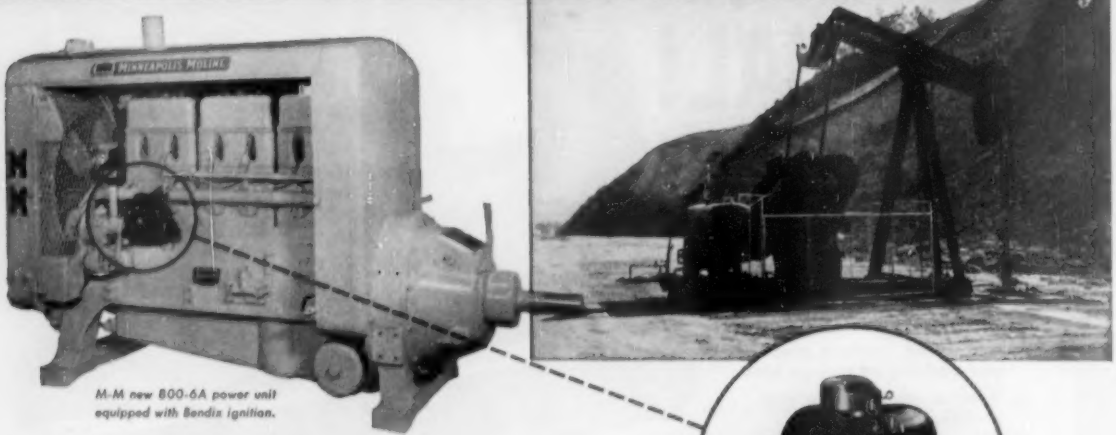
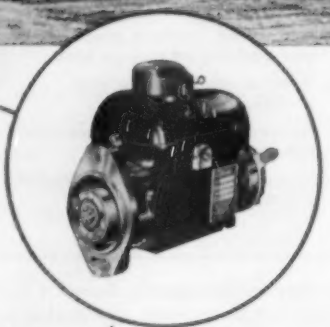




M-M new 800-6A power unit equipped with Bendix ignition.



with Minneapolis-Moline power units and Bendix ignition

Oil is the lifeblood of American industry. Minneapolis-Moline power units equipped with Bendix magnetos are helping materially to maintain a constant supply of this vital commodity. These versatile power units perform a great variety of services at many stages of petroleum production and processing.

The Bendix magneto selected by Minneapolis-Moline for this rugged service is a heavy-duty magneto with high electrical output for medium and large size engines of one, two, four and six cylinders. The magneto is supplied with fixed or variable spark and standard or low fire hazard ventilation. An impulse coupling provides for complete adjustment of lag angle and lug position.

Like all Bendix magnetos, the CBR series gives trouble-free performance for extremely long periods of time. Design simplification eliminates costly service maintenance.

Remember, Scintilla Division of Bendix manufactures a complete line of ignition for every industrial purpose. Our sales department will gladly furnish complete information.

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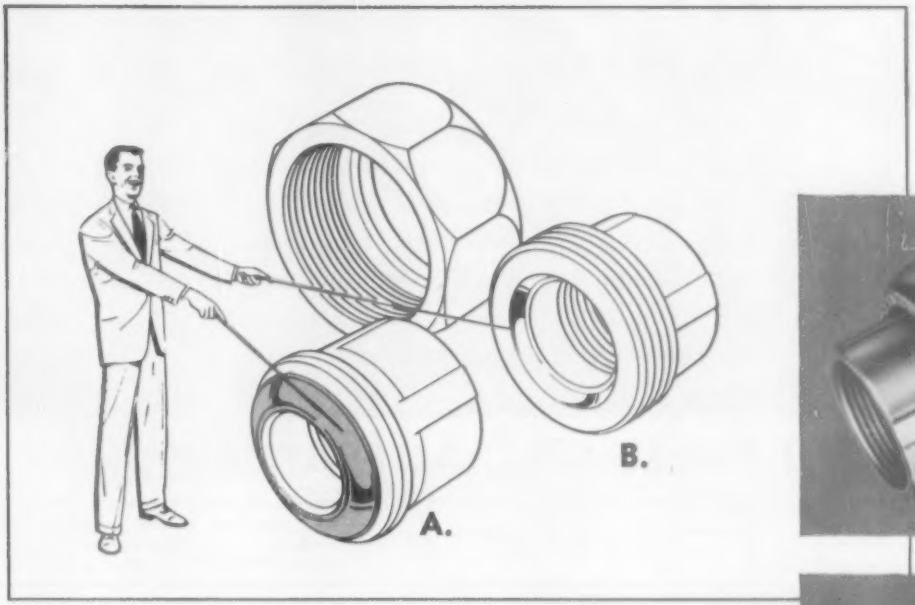
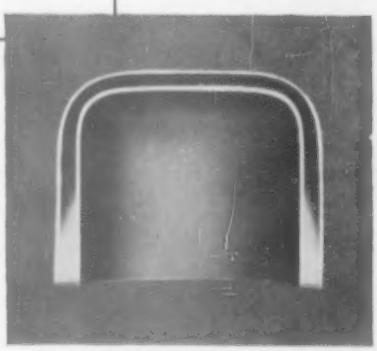
Bendix





Because the male seat ("A" above) is 150 Brinnell harder than the female seat ("B")---

Rockwood unions will not gall in "making up"

Special engineering design and processing creates this hardness differential and the toughness you've been needing in replacement and new work. AISI Molychrome steel and *special* heat treating give the male seat its greater degree of hardness . . . preventing galling in "making up."

Exclusive Rockwood cold working process results in maximum resistance to expansion, shock, jar and vibration, thus insuring maximum long-life strength. Balanced design distributes this strength uniformly throughout.

You also get . . .

★ Seats double-locked under pressures of 100,000 and 400,000 lb.

★ Absolutely interchangeable parts for speedy replacements.

★ Plug type ball-to-cone design — no sharp corners — (eliminates scratching and damaging when making up in tight places).

★ "Rockwoodizing" protection of entire Union against corrosion.

Rockwood Unions are tested and listed by Underwriters' Laboratories, Inc. for use with flammable liquids and gases. Rockwood Steel Union #603 is the first to give such safety under pressure — and at great economy.

If you are not already using this new union, mail coupon today for full information.

In Processing Rockwood Cold Forged Steel Unions, cold working makes core fibers follow the shape of the union for best under-pressure performance. Creates a hard, high tensil, outer skin that will stand more abuse and has greater strength than any other union on the market.

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Worcester 5, Mass.

SEND FOR THIS INFORMATIVE BOOKLET

ROCKWOOD

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Please send me prices and further data on the new Rockwood Union #603. I would like the name of the nearest Rockwood distributor.

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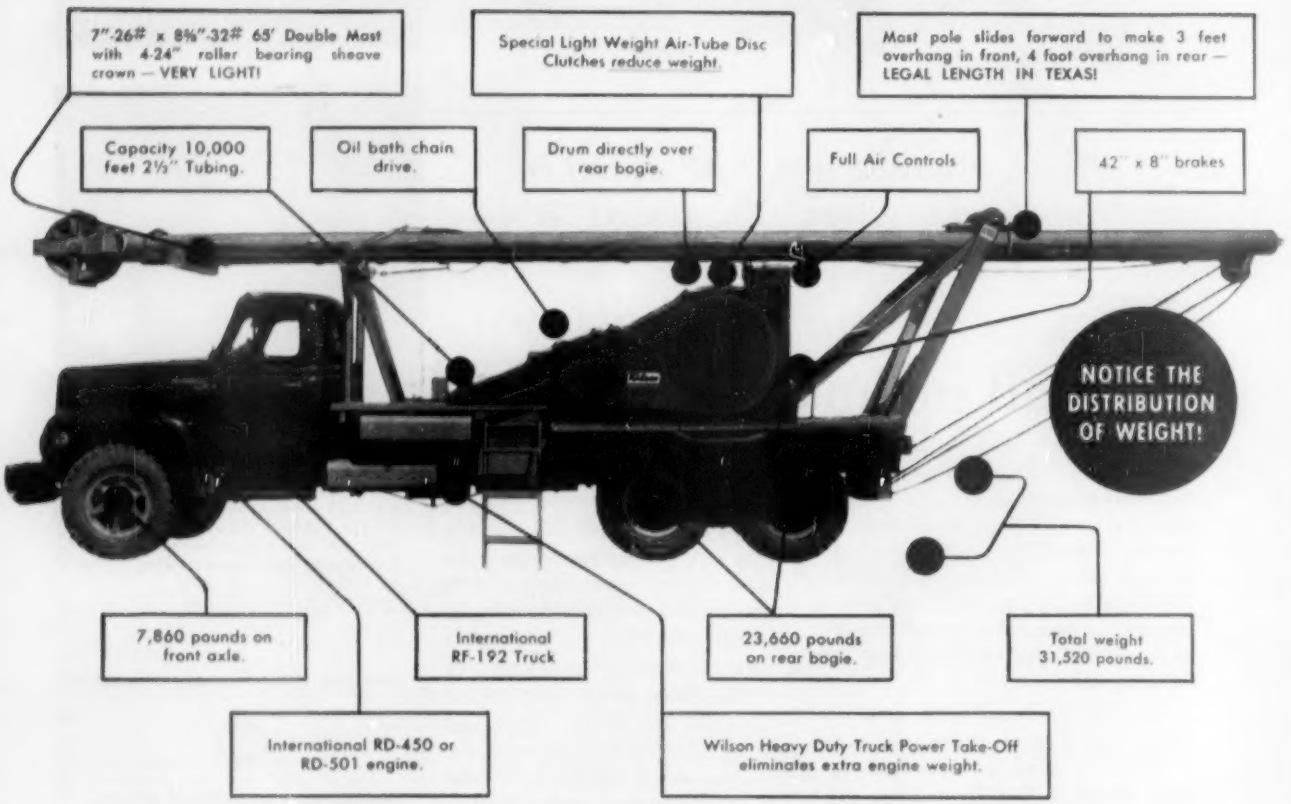
IN DEEP WELL SERVICING WINCHES

To conform with the legal weight, length and width set up by the individual states, WILSON has developed the Mogul "42." This winch is undoubtedly the most modern winch in the field and is rapidly gaining great popularity. This modern winch has been combined with the New Wilson Heavy Duty Truck POWER-TAKE-OFF and the new Wilson Masts to make a COMPLETE WELL SERVICING UNIT that meets all weight requirements.

LOOK AT THESE SPECIAL FEATURES


7"-26# x 8⅝"-32# 65' Double Mast with 4-24" roller bearing sheave crown — VERY LIGHT!
Special Light Weight Air-Tube Disc Clutches reduce weight.
Mast pole slides forward to make 3 feet overhang in front, 4 foot overhang in rear — LEGAL LENGTH IN TEXAS!
Capacity 10,000 feet 2½" Tubing.
Oil bath chain drive.
Drum directly over rear bogie.
Full Air Controls
42" x 8" brakes
NOTICE THE DISTRIBUTION OF WEIGHT!
7,860 pounds on front axle.
International RF-192 Truck
23,660 pounds on rear bogie.
Total weight 31,520 pounds.
International RD-450 or RD-501 engine.
Wilson Heavy Duty Truck Power Take-Off eliminates extra engine weight.

MOGUL "42" COMPLETE WELL SERVICING UNIT

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PETROLEUM CHEMICALS DIVISION
NEWS

February ★ One of a Series of Interest to the Petroleum Industry ★ 1955

NEW BOOKLET

to help you explain surface ignition to non-technical people

Outside of a small group of specialized engineers, few people understand surface ignition.

What causes it? How does it manifest itself? What are its harmful effects? And what can you do to overcome the problem?

The chances are you are frequently asked these questions, by outsiders and executives of your own company. But accurate, clear-cut, easy-to-understand answers are often hard to come by.

So to help you promote a better and wider understanding of surface ignition, and the problems surrounding it, Du Pont has prepared an eight-page booklet entitled "Combustion and Surface Ignition." It is profusely illustrated in full color. And it explains quickly and understandably the phenomenon of surface ignition and the technical terms used to describe it.

The booklet is now available to fuel engineers for limited distribution. Any of our regional offices will be glad to supply you with a sample copy and information on obtaining additional copies.

Unique Dust-Injection Engine for Studying Surface Ignition

In order to study the erratic process of surface ignition under controlled conditions, engineers at the Du Pont Petroleum Laboratory have developed a novel technique, called the "aspirated deposit surface ignition test."

In this modified C.O.T. engine with electronic counter, engineers can create controlled surface ignition by introducing a small amount of powdered combustion chamber deposit.

The technique uses a single-cylinder engine, modified to permit the introduction of a small amount of combustion chamber deposit into the intake port. This *dust-injection* engine uses a fuel susceptible to surface ignition, containing benzene or diisobutylene. To isolate chemical reactions associated with surface ignition, the engine operates under typical non-knocking conditions.

Pin-pointing ping

The number of surface ignitions caused by the introduction of the combustion chamber "dust" is taken as the measure of surface ignition harm of deposits.

Surface ignition is detected by an internal type of pickup, mounted in the engine cylinder. The number of surface ignitions is counted by a four-decade counting unit actuated by a signal from the pickup.

Findings from this unique test method reveal the relationship between the composition of combustion chamber deposits and their contribution to surface ignition.

A New Company With Established Services For Your Canadian Operations

DU PONT COMPANY OF CANADA LIMITED, and its Petroleum Chemicals Division, offer a wide range of marketing, technical and safety services to all oil companies operating north of the border. If you are considering expansion in or to Canada, these services can have an important bearing on your plans.

THESE THREE recently completed forecasts deal with the Canadian market exclusively. They cover gasoline, passenger cars, commercial vehicles and farm tractors—for the period from 1954 to 1960. They are offered as an oil industry service by Du Pont of Canada.

Suppose, for example, you want to build a new refinery in Alberta. You want to employ local workers wherever possible. But training local blending plant personnel in the safe handling of tetraethyl lead presents a real problem. To transport a special training crew from the States is likely to prove difficult and costly.

Here is a typical case where a Du Pont of Canada representative can be extreme-

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Du Pont of Canada*

ly valuable to you. And in addition to helping with employee training and safety projects, the Canadian representatives are prepared to offer many specialized services in connection with the design, site selection, construction, and operation of your blending plant.

Who, what, where? . . .

Du Pont of Canada is a separate, individual company . . . one of two companies recently formed out of the former Canadian Industries Limited.

Its Petroleum Chemicals Division has its headquarters in Toronto, with branch offices in Montreal and Calgary. It handles the complete Du Pont line of lube oil, fuel oil and grease additives, as well as gasoline dyes, antioxidants, Metal Deactivator and tetraethyl lead.

The Canadian sales-service representatives have had the same extensive technical training and oil industry experience as their stateside colleagues. And the services they offer are exactly parallel, too.

Developing a new market

With all forecasts pointing to a tremendous expansion in the Canadian economy during the next few decades, it can be expected that petroleum products marketing, as well as production and refining, will play an increasingly important role in Canadian Oil Industry activities.

To help you make the most of this growth potential, a wide range of movies, booklets, special presentations and other sales promotion aids are available to Canadian marketers through Du Pont of Canada. And this service also includes such industry-wide public relations programs as the well-known Du Pont "Magic Barrel."

Laboratory services, too

Although the five Du Pont Petroleum Chemicals Division regional laboratories are located in the United States, the services of these unique laboratories are available to all Canadian oil companies.

What's more, the Petroleum Chemicals Division of Du Pont of Canada is backed up by the basic research activities of the Du Pont Petroleum Laboratory and Experimental Station in Wilmington.

So if you are now operating in Cana-

Continued—bottom of next column

da or plan to in the future, be sure to keep in touch with one of the Du Pont of Canada Petroleum Chemicals Division representatives. He can be a very helpful man to know.

CANADIAN MANAGER

MILTON A. DEWEY is manager of the Petroleum Chemicals Division, Du Pont Company of Canada Limited.

After graduating from the University of Illinois with a B.S. degree in Chemical Engineering, he joined the Mid-Continent Petroleum Corporation in Tulsa, Oklahoma as a refinery engineer. Mr. Dewey left Mid-Continent to accept a research fellowship at Pennsylvania State College—working in the Petroleum Refining Laboratory, sponsored by the Pennsylvania Grade Crude Oil Association.

He then joined the staff of the Gulf Research Corporation in Pittsburgh and later became head of this company's Analytical Laboratory, in charge of research on turbine and electrical oil additives.

Mr. Dewey came to Du Pont in 1937. One of his first jobs at Du Pont was as liaison between the oil company research laboratories and various Du Pont laboratories. In this capacity, product development work was one of his chief responsibilities.

MILTON A. DEWEY

In 1950, he was transferred to Canadian Industries Limited, in charge of petroleum chemicals sales. He continued in this assignment until Du Pont of Canada was formed last July, at which time he was appointed to his present position.

Sales Opportunity for Lube Oils With Low-Duty Detergents

For 48% of American passenger cars, the average trip is less than 4 miles. For 75%, it is less than 10 miles. For only 15% it is 16 miles or over. And for all city busses, taxis and delivery trucks, more than 90% of their total operation is local stop-and-go traffic.

And these low-power, low-temperature operating conditions lead to excessive build-ups of engine sludge.

But these adverse driving conditions do not necessarily represent an obstacle to you. You can turn them into a real sales opportunity for your brand of motor oil. How? . . .

By adding one of the new polymeric lube oil additives to your motor oil (Du Pont Lube Oil Additives 564 and 565).

Being outstanding detergents and viscosity-index improvers, these double-action additives are exceptionally effective and economical for retarding sludge formations caused by low-power, low-temperature driving conditions. And being ashless, they leave no metallic deposit.

For more details on these new additives, contact any of our regional offices listed below.

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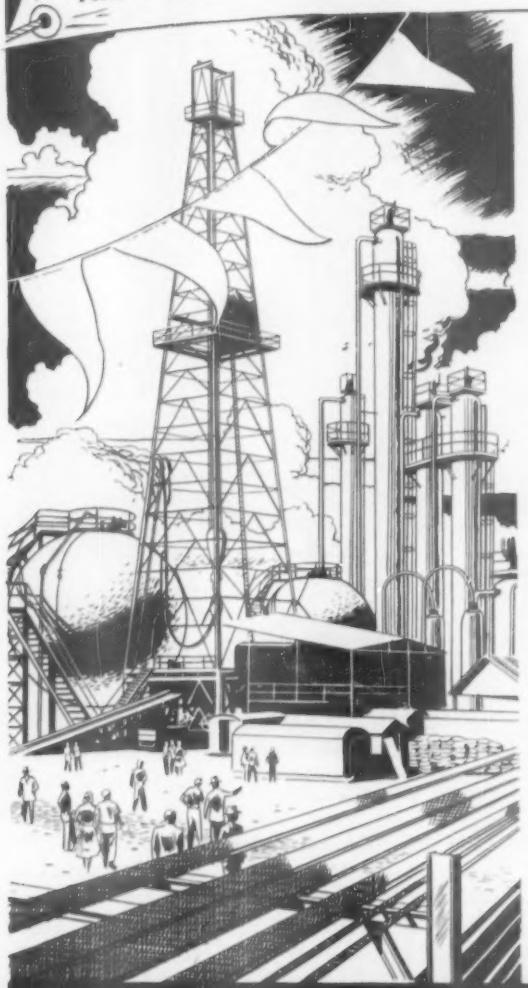
OIL SHOW

HOUSTON MAY 3 THRU 8 '55

AIR CONDITIONED COLISEUM AND ADJOINING EXPOSITION GROUNDS



Featuring scientific and technical development of equipment for: OIL FIELDS . . . REFINERIES . . . PETRO-CHEMICAL PLANTS . . . TRANSPORTATION AND PIPE LINES.

IDEA GETTERS: Progressive executives and engineers are always on the lookout for new ideas. Here is the place to find them . . . ideas that will help solve your problems.

BUYERS: See the latest equipment at a place where you can compare . . . saves you time . . . gives you better buys.

SELLERS cannot afford to pass up this opportunity to demonstrate their products when buyers want to see, want to listen, and want to buy.

EXHIBITORS GET BIG RESULTS AT A SMALL COST

NO FRILLS: Just a down-to-earth exposition where the seller can demonstrate his products and where the buyers can see them.

Take advantage of the money spent to bring oil men to the show. For a small, nominal amount of money—$275 for a booth—you get not only this space but also the advantage of the fifty- to one-hundred-thousand dollars' worth of advertising, publicity, and promotion to bring in the types of people you want to examine your products.

This is the kind of trade show used to demonstrate many other products throughout the country—a show that costs the manufacturer little money—a show that saves time for the potential buyer by keeping out the curiosity seekers. **It will be a business-like exposition for oil men.**

SUCCESS ASSURED BY AMAZING RESPONSE TO LETTERS OF ANNOUNCEMENT . . .

75% of space already sold

The demand for this show in Houston—the world oil center for both oil production and oil equipment manufacture—has been 'way beyond the highest expectations.

GET A GOOD BOOTH LOCATION OR A GOOD EXPOSITION GROUNDS LOCATION . . . *NOW!*

ADMISSION FREE . . .

BY INVITATION

Men connected with any branch of Industry will be provided with complimentary tickets. Come as often as you desire. Tickets can be obtained from exhibitors, or by requests made to the Exposition Management.

MANUFACTURERS AND SELLERS:
Write today for list of exhibitors who have already signed contracts, and for space reservation forms.

INTERNATIONAL OIL EXPOSITION
1416 Melrose Building, Houston 2, Texas
Telephone BLackstone 6234

Name of Company_____

Address_____

City_____ Zone____ State_____

9484

"Here's a hose

Here are rigs that show why "Red" talks as he does:

Toolpusher Lefty Wood on rig N-75, with John Fuller, U. S. Rubber sales engineer.

Jackknife rig N-75 of Oil Production & Maintenance Co. Says "Red" Royal: "This rig uses a U. S. Royal 4 Rotary Hose (serial no. 0-747-F) that's already drilled 250,000 feet and has been in service for 3 years. Lefty Wood, toolpusher on the job, says 'Looks like this hose will never wear out.' Lefty's boss is operating 8 rigs, and won't have any other rotary hose except Royal 4. Why should he, when his rotary hose costs on this rig average far less than 1¢ per foot drilled!"

Driller J. A. Humphries of rig U-15 gives facts to John Fuller.

Rig U-15 of Oil Production & Maintenance Co. "Red" remarks: "Here again the U. S. Royal 4 just never seems to conk out. 260,000 feet so far in 3 years' service (serial no. 0-657-F). Photo shows the driller, J. A. Humphries. Toolpusher Vergil McAdams is not shown. Another rig, U-20, Irwin French toolpusher, has a U. S. Royal 4 that has drilled over 300,000 feet in over 3 years. His hose costs per foot drilled were less than a measly penny."

Developed by Science—Proved by Drillers

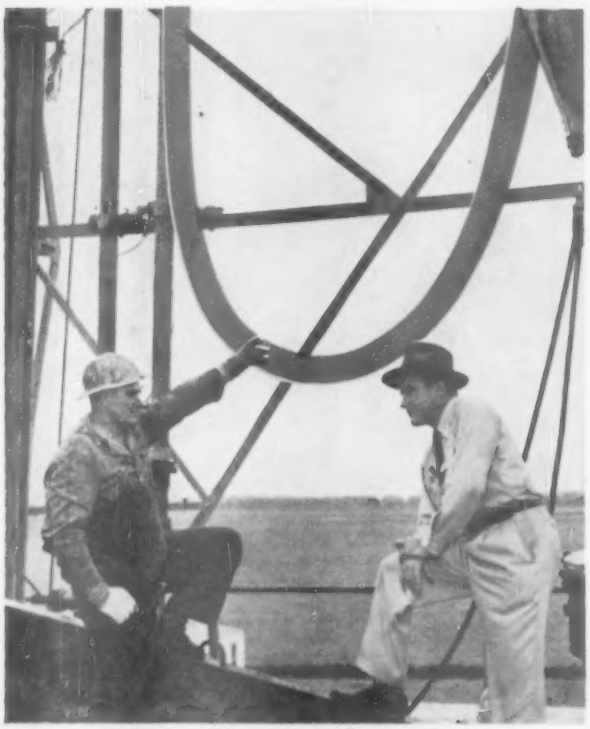
US RUBBER

UNITED STATES

MECHANICAL GOODS DIVISION

you'll never beat!"

says "Red" Royal about U. S. Royal 4 Rotary



Driller D. C. Helms on rig 3 tells John Fuller the U. S. Royal 4 has been on the job over 4 years.

Standard drilling rig No. 3 of Prince Drilling Co. Says "Red": "Driller D. C. Helms at the left in the photo, uses Royal 4 without ever worrying about how high the drilling pressures get. Even at the current depth of 16,500 feet U. S. Royal 4 has never blown. No matter what the style, make or size of mud pump, you can count on Royal 4. This U. S. Royal 4 has been in service now for 4 years, at a cost of less than a cent per foot drilled. Toolpusher is Ted Kirby."

Consider what these performance records mean . . . and remember that the average life of ordinary rotary hose is 18 months and the average drilling footage runs only from 80 to 90 thousand feet per hose. No wonder U. S. Royal 4 is the kingpin of rotary hose!

Built far in excess of API specs, U. S. Royal 4 is the United States Rubber Company hose that's built to handle the highest drilling pressures used anywhere today. When your present hose reaches retirement age, be sure to order a U. S. Royal 4 replacement from your field supply store.

MAKE YOUR NEXT ROTARY HOSE U. S. ROYAL 4

RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

"The right wire rope? That's *EASY* every time!"

It's a cinch to pick the right wire rope for top equipment performance . . . and it pays off! Roebling's new catalog has a section devoted to rope for the oil fields . . . shows at a glance the best rope for each purpose and gives you a simple, unique code number system which for the first time in history *positively* identifies the desired rope.

* * *

Write for your copy of the new "Roebling Wire Rope Recommendations and Catalog". And remember that the Roebling Field Man at your nearest Roebling office is always available to help find the special wire rope to solve your problems. District offices at Cleveland, Denver, Houston, Los Angeles, Odessa, Tulsa and Chicago.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

THERE'S A ROEBLING DISTRIBUTOR IN YOUR PHONE BOOK

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J.

Now Cutler-Hammer offers an

IMPROVED OIL WELL PUMPING CONTROL

. . . that provides easy in-the-field modification of restarting characteristics

Improved C-H Oil Well Pumping Control permits easy in-the-field modification to the type of restarting desired after power interruptions.

The NEW Cutler-Hammer Oil Well Pumping Control offers the same features which have made it the outstanding choice of oil field engineers; famous C-H dust-safe vertical contacts, finest program time-switch, *full* three-phase overload protection, incomparably cool C-H trouble-free operation. But another *exclusive* advantage has been added. This control may now be modified easily *while in use* to meet changes which occur in field operating conditions. The control panel now readily accepts either a C-H Low-Voltage Relay or a C-H Time-Delay Relay; panel space is provided and the panel is drilled. A diagram inside the cover shows all circuit arrangements with leads numbered to permit easy wiring changes.

Every oil field engineer will quickly grasp the significance of this improvement. With the basic Cutler-Hammer Oil Well Pumping Control, pumps resume operation as soon as power is restored after an interruption . . . as when lightning strikes the power lines. This is fine when there are only a few wells. But as a field grows, the combined load of many pumps restarting together is too heavy. Then either C-H Low-Voltage or Time-Delay Relays are added to the control. Low-voltage relays drop open on power interruptions and must be reset at each well. Pumps are thus restarted one at a time. Where automatic restarting is desired, the time-delay relays are used . . . set for different time intervals. When power is restored after an outage, one pump after another then restarts automatically . . . as determined by the different time-delay settings.

Ask to see this new control now. Or write for descriptive bulletin. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

Cutler-Hammer Program Time Switch for scheduling of pumping cycle automatically. Day-omission feature available.

MEMBER AMERICAN PETROLEUM INSTITUTE

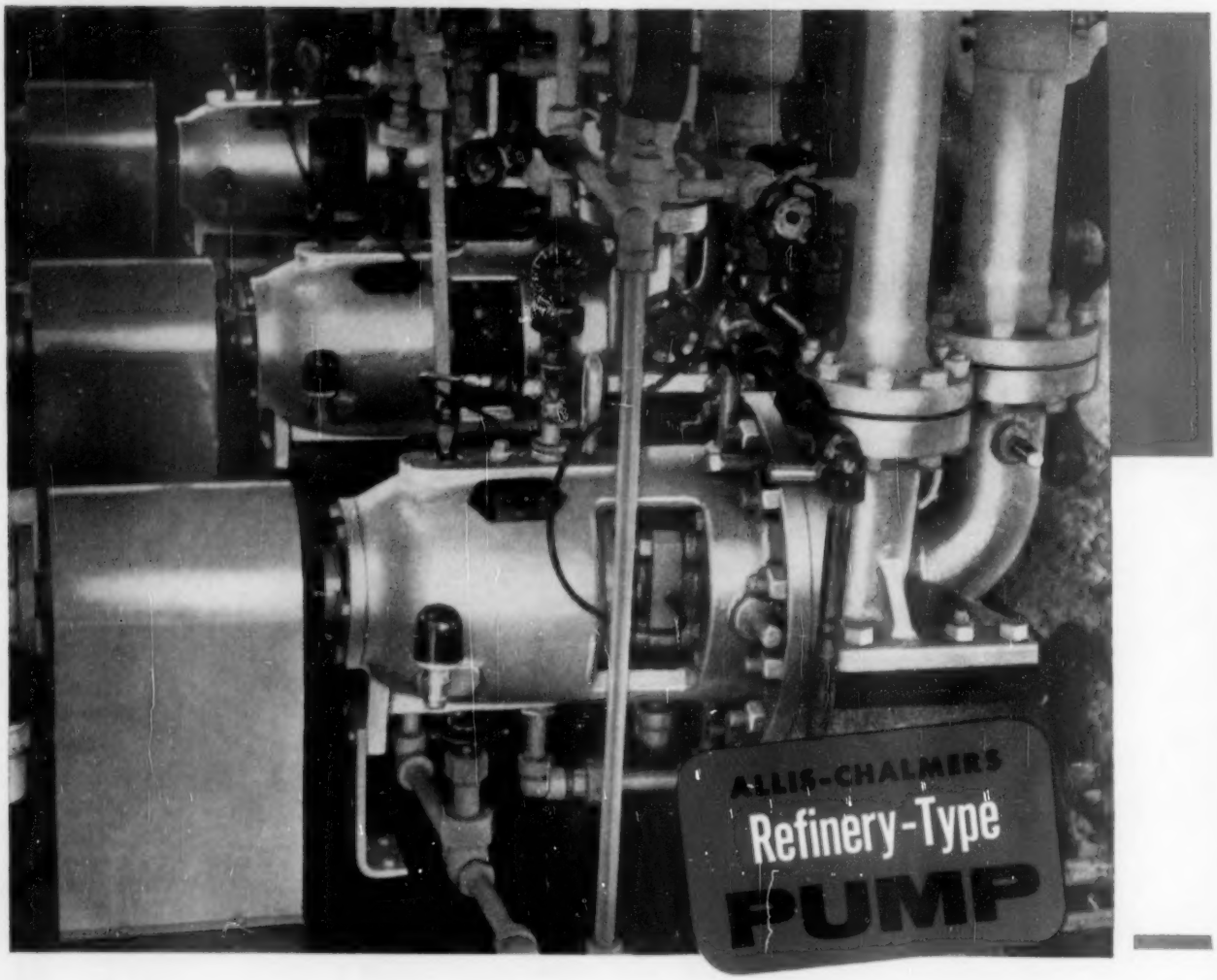
CUTLER-HAMMER
MOTOR CONTROL
C-H

Midland County, Texas

Hot Springs County, Wyoming

Lea County, New Mexico

Sun Oil uses



Ample Reserve Strength in Every Detail of Construction

Sealing — Various types of packing and mechanical seals or combinations of both can be obtained to suit the application.

Cooling of stuffing box and bearings can be provided by water or oil, in five separate places. Water-cooled pedestal available for extremely high temperature operation.

Wearing rings, front and rear, are provided on both impeller and casing.

Shaft and bearings are of exceptionally heavy design to reduce deflection and vibration, assure long wear, low operating costs.

Throat bushing and base ring are renewable. Close fit on shaft reduces infiltration into stuffing box. Cannot blow in or out.

Double volute casing used on pumps above 400 gpm greatly reduces deflection forces. Low NPSH design successfully handles highly volatile liquids at high temperatures.

ALLIS-

eleven of these pumps

Where Service Continuity Is Essential

ELEVEN of these Allis-Chalmers refinery-type pumps are installed on a variety of continuous duty applications at a refinery of the Sun Oil Company, Limited. They are top suction, water-cooled units with standard high temperature packing. These pumps have the stamina to keep going on the toughest applications for years without down time. Every construction detail has been carefully engineered to provide ample reserves of strength and durability.

wide choice of materials and features

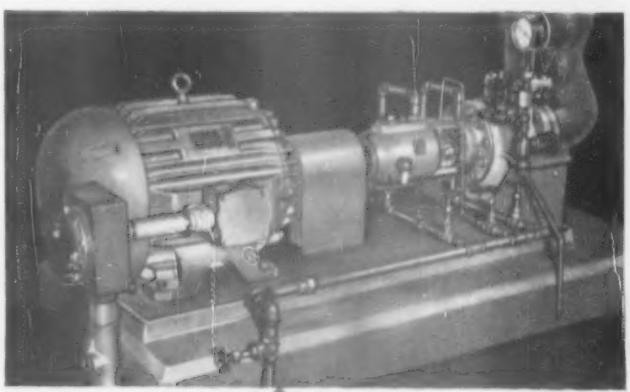
The Allis-Chalmers refinery pump can be fitted to suit your requirements exactly. Practically any material normally used in pumps may be specified. Stuffing box takes packing, mechanical seal or both. Cooling water or oil may be used in five separate places, so you can select exactly the cooling arrangement for your particular needs. Suction may be at top or on end.

get complete information

Your nearby Allis-Chalmers representative will be glad to help you with your refinery pump problems. Or write for Bulletin 52B7775. Allis-Chalmers, Milwaukee 1, Wisconsin. A-4557

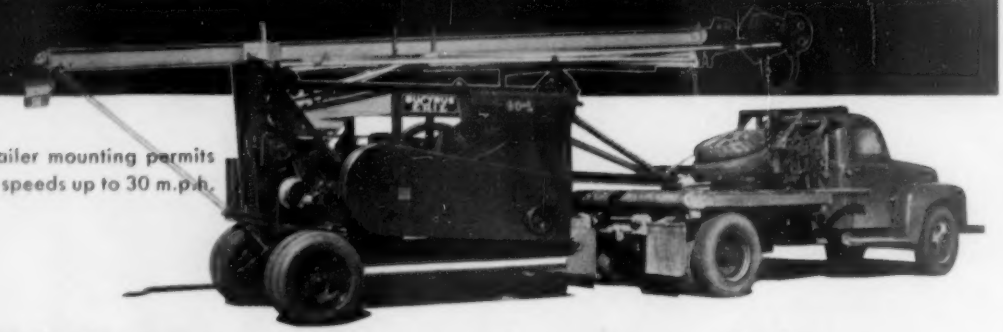
get complete unit / pump motor control

Allis-Chalmers will supply a complete pumping unit — pump, motor and control — engineered to work together and with pump and motor mounted on a single base plate ready for installation. You save engineering time because you don't have to match components from different manufacturers. You save purchasing time — only one order. And, most important, you are sure that the components will work together to give you long life at low operating cost. The complete unit is covered by a single guarantee backed by Allis-Chalmers well-known customer satisfaction policy.



CHALMERS

Putting New Meaning Into Mobility



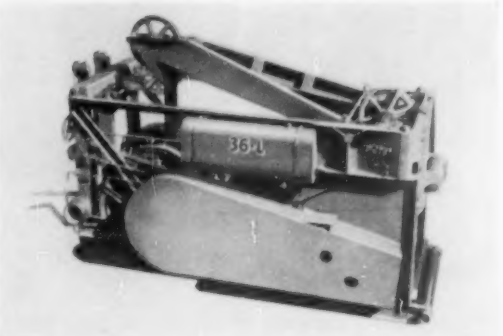
This semi-trailer mounting permits traveling at speeds up to 30 m.p.h.

With Bucyrus-Erie Spudders

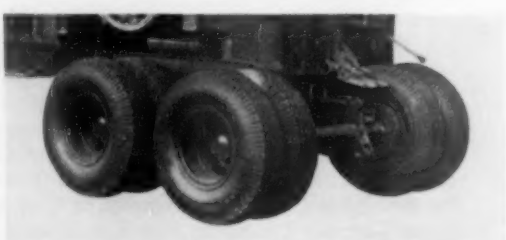
With Bucyrus-Erie spudders, mobility means more than mere "travel-ability". It means really fast tear downs, speedy moves, and quick setups on new locations — all can be done in hours with as few as two or three men.

The secret of the moving speed of Bucyrus-Erie spudders lies in their sturdy, compact construction, all-round balance, telescoping derricks, and a choice of three efficient mountings—semi-trailer, tandem axle or skid. These features combine to give you spudders that really "get around", cutting idle-rig time to a bare minimum, and allowing more time for actual drilling.

Speed is the keynote of drilling with Bucyrus-Erie spudders, too. The extra footage derived from a dependable direct-drive drilling motion means still more profits on your drilling jobs. Investigate these spudders now — they're your key to extra profits. See your nearby Bucyrus-Erie spudder distributor for complete information. 3554



The skid-type mounting, an integral part of the all-steel frame, slides easily on and off trucks, derrick floors, or mudboats.



Compactly built tandem axle mountings give added mobility to the larger 36-L and 48-L spudders.

BUCYRUS ERIE

South Milwaukee, Wisconsin

FIRST with the FINEST in Spudders

What Mr. Tubes Can Do For You

—about pressure tubing

When it comes to pressure tubing, you're wise to talk to somebody who knows your problems. Mr. Tubes, your nearby B&W Tube Representative, serves the oil, chemical and petro chemical . . . and related fields . . . faithfully and efficiently. He is constantly concerned with tubing problems his customers encounter, and he devotes a lot of his time to helping find the right answers to questions of pressure and temperature.

Mr. Tubes can do a lot for you. Next time pressure tubing is on your mind, call on him.

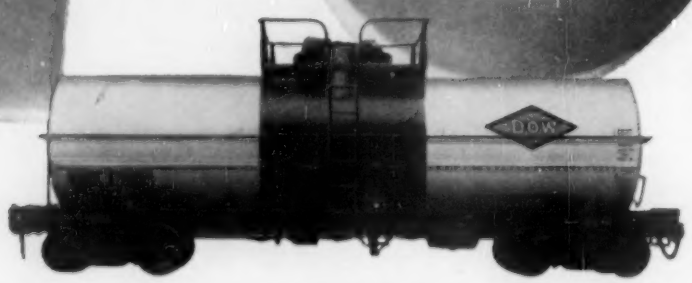
B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Stainless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

TA-1802(1)

DOW

73%



DOW CAUSTIC SODA

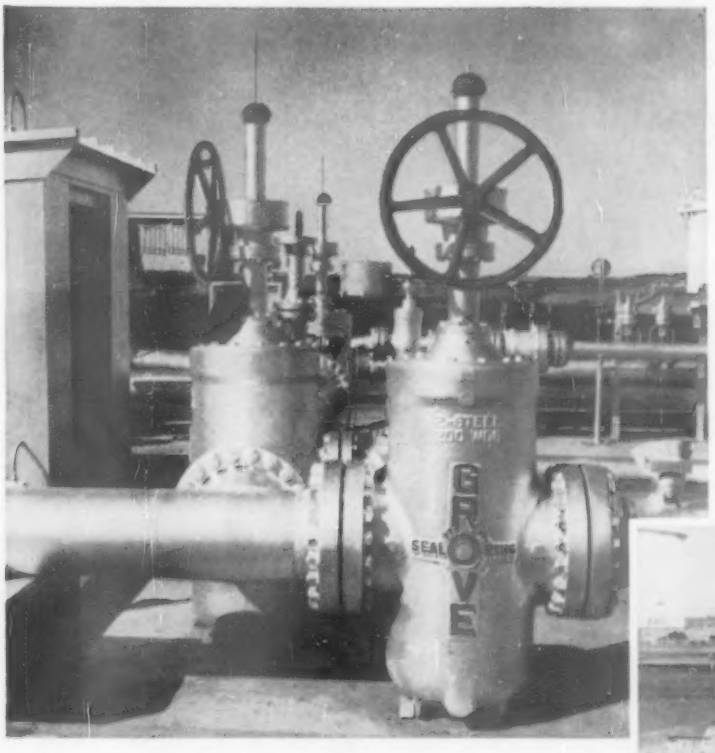
Availability of 73% caustic soda solution from Dow is now importantly increased. Two new bulk terminals—at Bayonne, N. J. and North Charleston, S. C.—are speedily serviced by the new liquid chemicals tanker *S. S. Marine Dow-Chem*. These added distribution points, plus expanded 73% production facilities at Midland, Mich. and Freeport, Texas, mean *faster*, more *economical* delivery to the growing number of 73% caustic users.

Our Alkali Sales Department will gladly assist you in accurately figuring your potential *savings* with 73% caustic. THE DOW CHEMICAL COMPANY, Dept. AL-362C, Midland, Michigan.

you can depend on DOW CHEMICALS

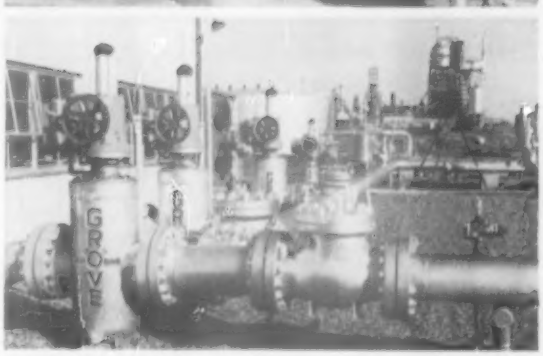
DOW

Over 175 Grove Seal-"O"-Ring Gate Valves on major products pipeline...



provide dead-tight seal...without lubrication or sealing compound!

- NO PRODUCT CONTAMINATION
- NO LUBRICATION SERVICE PROBLEMS



Over 175 Grove Seal-"O"-Ring Gate Valves are in operation on the Oklahoma Mississippi River Products Line extending from Duncan, Oklahoma to West Memphis, Arkansas. Illustrated here are some of the varied applications at the Duncan and Fort Smith stations.

Particularly important on product lines is the fact that Grove Seal-"O"-Ring Gate Valves maintain dead-tight seal and full freedom of operation without lubricants or sealing compounds which might contaminate products. For the full story on Seal-"O"-Ring Gate Valve performance . . . available from 2" to 36" sizes . . . for products, gas, or crudes . . . contact your Grove representative today.

408

GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California

HOUSTON 4—1901 Calumet St. • **LOS ANGELES 6**—1930 W. Olympic Blvd. • **NEW YORK 17**—415 Lexington Ave.

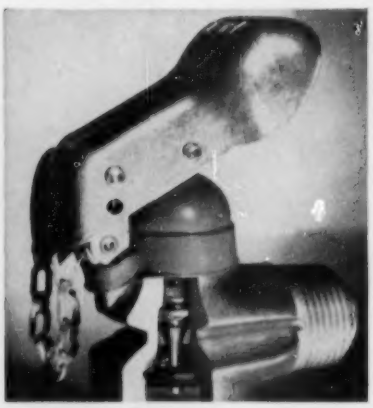
ODESSA, TEXAS TULSA, OKLAHOMA LAFAYETTE, LA. CHICAGO, ILL. DENVER, COLO.

GROVE SEAL O RING GROVE SIMPLICITY ACCURACY SAFETY

Here's why Ansul extinguishers give you faster, more dependable fire protection!

READY for instant action under the most severe exposure conditions.

WEATHER-TIGHT NOZZLES made of aluminum and stainless steel, can't rust. Neoprene cap and oil-impregnated washers keep out moisture.



PUNCTURE PIN. In this aluminum housing a stainless steel pin pierces the gas cylinder that supplies the propellent power for the dry chemical.

PATENTED NOZZLES. Straight or fan stream, the hazard determines which is installed. An Ansul exclusive for more effective fire control.

FIELD RECHARGING. Just 4 minutes after a fire is extinguished your Ansul unit can be recharged, ready for action. No special tools are needed.

The pictures on this page tell half a story. The complete story includes Ansul's facilities for training your personnel in the science of fire control and prevention. Experience has taught us that *complete* fire protection demands *both*—fast, dependable equipment and trained personnel to man that equipment. Ansul can provide both. Get in touch with your local Ansul man, he has the complete story about *complete* fire protection.

Call the ANSUL MAN!

Get in touch with your local Ansul man through the "yellow pages," or write direct to ANSUL CHEMICAL COMPANY, Fire Equipment Division, Dept. F-91, Marinette, Wisconsin.

Write Ansul for your copy of New Fire Equipment Catalog.

ANSUL

How TIMKEN® bearings maintain rotor adjustment in versatile, heavy-duty pump

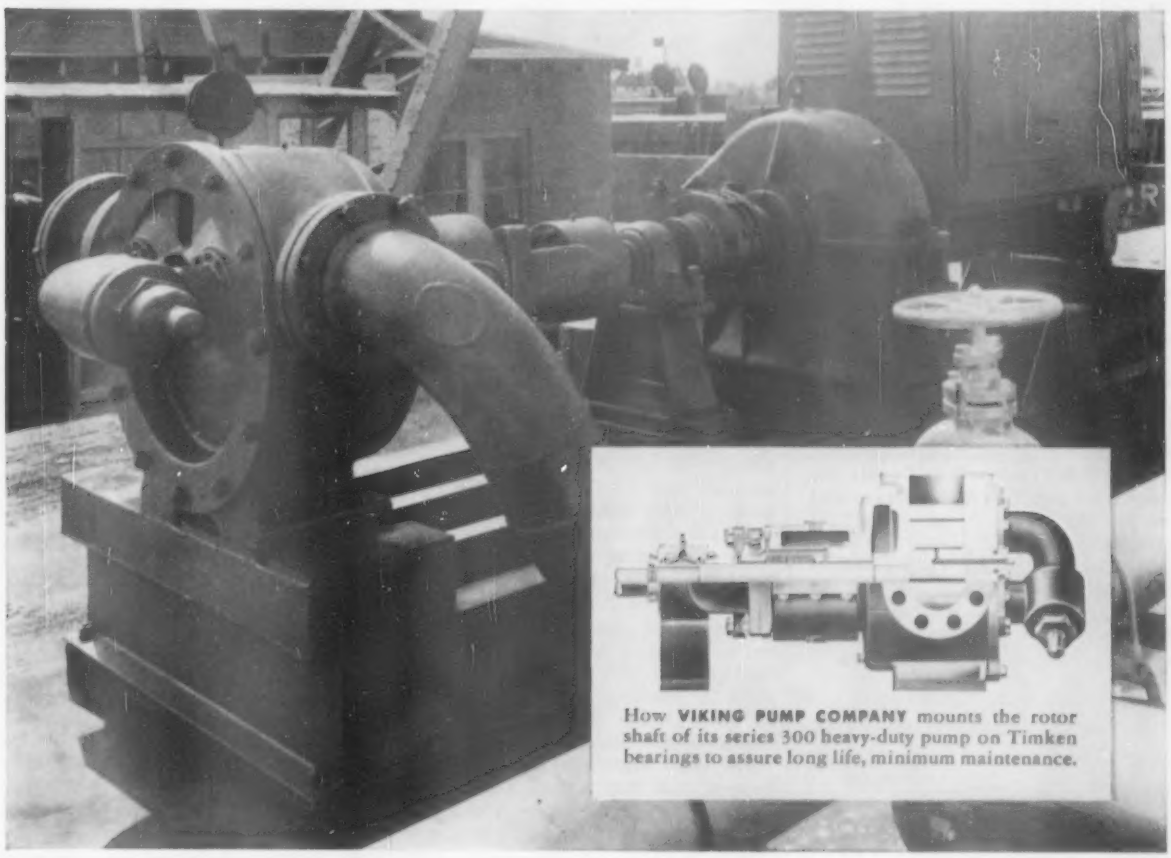
THE Viking Pump Company's series 300 heavy-duty pump was designed to give dependable performance, pumping thin or thick liquids. To make sure it delivers, Viking engineers specify Timken® tapered roller bearings for the rotor shaft.

Timken bearings provide thrust control for the large power-driven rotor shaft gear. They permit adjustments for proper end clearance and also prevent the pump rotor from wearing against the pump head. Their tapered construction lets them take heavy thrust loads as well as radial loads in any combination.

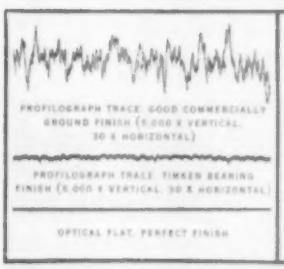
Timken bearings hold wear to a minimum because they practically eliminate friction. That's because they're designed to roll true and because they're made with microscopic accuracy to conform to their design. You're doubly assured of Timken bearings' quality because we make our own steel. No other U. S. bearing maker does.

So for long life and minimum maintenance, always specify Timken bearings. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **VIKING PUMP COMPANY** mounts the rotor shaft of its series 300 heavy-duty pump on Timken bearings to assure long life, minimum maintenance.


PROFILOGRAPH TRACE: GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
PROFILOGRAPH TRACE: TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
OPTICAL FLAT: PERFECT FINISH

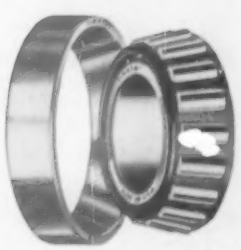
SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST ⟷ LOADS OR ANY COMBINATION

"Freaks!"
"Odd Balls!"
"Rube Goldbergs!"

Those are typical comments made when people look through PROTO's new brochure of special tools—a valuable guide you should have. Remember, each is designed for an important job in industry—to break a production "bottle-neck," to handle unusual repairs, to service manufacturer's original equipment, etc. Special PROTO tools cut costs for industries and Government . . . and can do the same for you. PROTO engineers will help you solve your special tool problems. Your PROTO dealer will consult with you and aid in getting just the tools you need. Write today for brochure No. 5328 on special tools ("Odd Balls") to

PLOMB TOOL COMPANY
2273S Santa Fe Ave., Los Angeles 54, Calif.

PROTO Makes Forgings, Too

With modern die-making facilities, drop hammer forges, high-speed forging machines, upsetters and hot forming equipment, PROTO can make almost any type of forging. Plants in Jamestown, N. Y., and Los Angeles, California, speed service.

5488

PROTO TOOLS
PROTO

They Say—

Valued Letter From Valued Friend

Dear Sir:

I have your flattering letter with the accompanying credentials, all of which make me a member of your Editorial Advisory Board. If I am tardy in acknowledging and thanking you for your courtesy, let me assure you that only a vicious attack of influenza, or some virus-minded malady, which laid me prostrate, has saved you from an immediate reaction on my part.

As a matter of fact your formal action in this matter is superfluous. I am already a member — self-appointed, self-annointed — of your advisory staff and have long functioned free-lance in this capacity. When have I ever failed to criticize and advise the Journal on its acts?

I am recovering too late to sound off for on "What Lies Ahead for the Petroleum Industry in 1955?" You are already in print and that problem is all solved. Even had I been perfectly well, I could not have made up my mind so soon as this. Can't you accord your advisers more time?

I find it difficult to rate policies or ideas in the order of their importance. Nevertheless, in the field of exploration I think we do nothing that ranks in importance with drilling of wildcat wells—and every well is a wildcat. Particularly, we need deep exploratory wells in localities that few geologists or geophysicists will recommend as structurally favorable.

We need another team like Frank Pickerel and Rupert Ricker (who discovered Big Lake), Roy Westbrook (who discovered Winkler County), George Church (who discovered University, Crane County), and another Dad Joiner (who discovered East Texas). These men all discovered major oil fields on locations that no geologist could find any reason to recommend at the time. Julius Fohs discovered Mexia by drilling a location that geological opinion had condemned as of faint promise.

It is important that we drill wells deep on locations of little or no promise in the light of our present knowledge. But we do less and less of this class of drilling. If we do not possess favorable

4 HELPFUL FACTS on well pumping efficiency

WHY YOU SHOULD SPECIFY

DARCOVA

the original composition valve cups

1. *Darcova* valve cups, seating cups and rings are manufactured to the highest known standards of quality and performance—backed by 50 years' experience.

2. *Darcovas* are *precision-built* for every size and make of pump. Uniformity and perfect *fit* are essential for high efficiency.

3. *Darcovas* are made in different textures to permit highest efficiencies under varying conditions of depth, pressure, temperature, fluids and abrasion.

4. *Darcova* expert field engineering service is yours to help *assure* peak performance at all times.

Be sure to specify DARCOVA at your supply store.

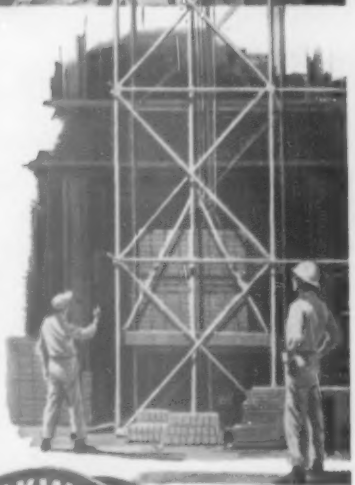
DARLING VALVE & MANUFACTURING COMPANY
DARCOVA
WILLIAMSPORT 1, PA.
THE ORIGINAL COMPOSITION CUP

MUSCLES OF STEEL
took the load off his back

Sweat and a strong back just aren't enough when it comes to meeting the stepped-up demands of modern construction work. Today's contractors and builders call on *muscles of steel*—sturdy wire rope—to lift and carry their heavy loads.

Supplying these *muscles of steel* to the giant that is American industry is our big job here at Wickwire—a job that has commanded our vigilant care and painstaking quality control for over half a century.

In the mines and the quarries. In the logging camps and the oil fields. On construction and highway projects. With the fishing fleets and in materials handling. Wherever wire rope is used, Wickwire Rope has earned an outstanding reputation for efficiency, utmost safety, long economical service and unfailing reliability.



every industry benefits from wire rope

WICKWIRE ROPE

CFI PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2487

THE COLORADO FUEL AND IRON CORPORATION—Atlanta (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
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WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Kankakee (Pa.) • New Orleans • New York • Philadelphia

structural evidence, we will not drill a deep exploratory well. So we stifle exploration in Florida, in Cuba, in the Delaware basin, in the Powder River basin, all of which, among others, should contain oil in major pools.

It may not be up to the Editorial Advisory Board to do so, but I approve the wresting of the Journal cover page from the grasp of the individual advertiser. The tradition and the dignity of the Journal cover page should be priceless assets. Preserve them. Make the cover page a research project in format and make up. Make it give expression to the Journal's long career of service to a great industry. Make it worthy of the Journal's achievements. Surely, the Journal can afford to clothe itself fittingly. It merits superior raiment. Clothes make the man—and the Journal.

I lament the Journal's frequent failure to place on its maps the two earmarks of the painstaking mapmaker—the north-pointing arrow and the scale. The Journal makes excellent maps, but it makes them carelessly. Please! For examples, see the January 10 issue, pages 157, 154 (the maps on pages 152 and 153 make no such inexcusable omission), 151, 90, 74, 52, and 49.

You will conclude from all the foregoing that, but for the flu, I might have offered you advice at some length. Anyway, the flu is better.

Wallace E. Pratt
Carlsbad, N. M.

Cover Comments . . .

. . . "Definite Improvement"

Dear Sir:

I just want you to know that here at Vickers we feel that the new cover on The Oil and Gas Journal is a definite improvement on the old one. All of us in this business are flooded with a great deal of reading material and it is a pleasure to be able to look at your new cover and immediately select those articles that are most interesting.

You have our best wishes and you may be certain that we, as always, look forward to receiving The Oil and Gas Journal.

J. A. Vickers
President
Vickers Petroleum Co., Inc.
Wichita, Kans.

. . . "Surprised"

Dear Sir:

Having been a subscriber to The Oil and Gas Journal for many years, I was quite surprised when I saw the cover on the January 3 issue even though the readers had been sufficiently warned in advance of a future change in policy—it was like losing an old friend. However, by the time I had received the January 10 issue, the cover change was not nearly as apparent. This is especially true since the news is still present in the magazine as in the past. I suppose it is just a matter of what you are accustomed to seeing . . .

Lester B. Swan
Executive Vice President
Brazos Oil & Gas Co.
Houston, Tex.

. . . "Should Increase Prestige"

Dear Sir:

Every now and then changes take place that, while not immediately evident, do in a short time make a definite impression.

In this particular case I am referring to the new format on the cover of The Oil and Gas Journal. We, of course, consider this an extremely important publication, and are more prone to look inside than on the cover when we receive a new issue, but now I am all of a sudden aware that you have dropped

...even under extreme conditions!

BARTON DP TRANSMITTERS accurately transmit flow, liquid level, and/or differential pressure with high speed, high sensitivity and low air consumption, regardless of temperature variation, pulsation, and severe over-range. Direct mechanical indicator insures continuity of operation on air failure; and together with accessible adjustments, simplifies field calibration. For further information request bulletin 214-1 or contact BARTON sales engineers, located in most principal cities.

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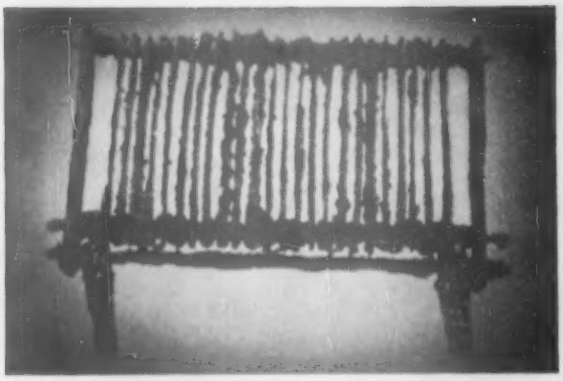
LABORATORY TESTING—The modern Chase laboratories provide an excellent testing ground for heat exchanger tubes under conditions met in many varied industries.



FIELD TESTING—This rack of test specimens was in a heat exchanger. These field tests help Chase perfect the alloy best suited for *your* job.

How to be *SURE* about HEAT EXCHANGER TUBES

Take Chase Antimonial Admiralty or Cupro-Nickel Tubes, for instance. You *know* they'll give you years of service. They're manufactured under carefully controlled conditions. They're tested for every stress, strain and attack. They're inspected again and again. When a Chase heat exchanger tube goes into service we're *sure* it will stand up. You can be sure, too.

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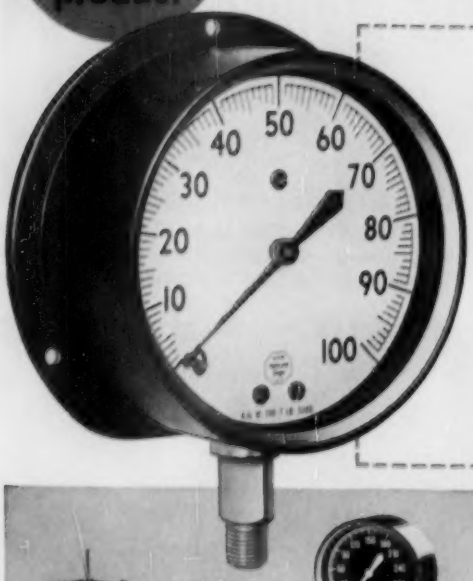
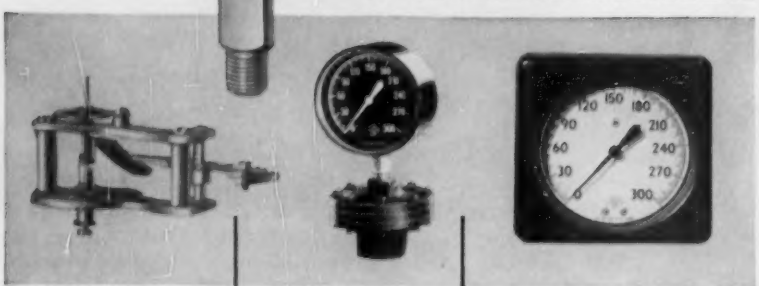
Helicoid Gages



gages for pressure, vacuum or compound service



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Helicoid Gage Division
AMERICAN CHAIN & CABLE

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Pressure • Vacuum • Compound

the advertising material from the front cover and gone into pictorial treatment. I think this should go far to further increase the prestige of this publication . . . I hope that it brings your publication added success.

W. B. Curtis
Manager
Public Relations Department
General Petroleum Corp.
Los Angeles

. . . "Real Eye-Catcher"

Dear Sir:

I have been delayed in commenting on your new cover, but I did want to let you know how well received it was at Caterpillar Tractor Co. Your January 3 issue was a real eye-catcher, and . . . this is no doubt the best way to serve your readers. I do hope that your new cover will prove successful. . . .

Jerry Cook
News Editor
Caterpillar Tractor Co.
Peoria, Ill.

. . . "Enthused"

Dear Sir:

I am very enthused by the change over in your cover and feel it is a tremendous improvement. It should add a great deal in bringing the magazine to the attention of possible new readers . . .

. . . (You can) feel sure that I will continue to read the Journal regularly.

R. B. Curran
President
Canadian British Empire
Oil Co., Ltd.
Calgary, Alta.

CALENDAR

FEBRUARY

10-12 Seventh Southwestern IRE Conference and Electronics Show, Baker Hotel, Dallas.

13-17 American Institute of Mining and Metallurgical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.

13-18 A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston.

14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.

16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.

23-24 Pacific Coast Gas Association, seminar on electronic data processing, Los Angeles.

25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

1-2 American Gas Association committee on natural gas reserves, Baker Hotel, Dallas.

1-2 Fourth Symposium on Subsurface

Geology, University of Oklahoma School of Geology and Oklahoma Geological Survey, Oklahoma Memorial Union Building, Norman, Okla.

4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.

4-5 Wilcox Trend Symposium, Eighth Oil Recovery Conference, Texas Petroleum Research Committee, Texas A. & M. College, College Station, Tex.

7-11 National Association of Corrosion Engineers, Palmer House, Chicago.

9-11 American Petroleum Institute, Division of Production, Southwestern spring meeting, Jung Hotel, New Orleans.

17-18 Southern Gas Association, Distribution Management Conference, Jung Hotel, New Orleans.

20-23 American Institute of Chemical Engineers, Kentucky Hotel, Louisville.

23-24 Pacific Coast Gas Association, accident prevention conference, Santa Barbara, Calif.

23-25 American Petroleum Institute, Division of Production, Mid-Continent District, Herring Hotel, Amarillo, Tex.

27-29 Texas Independent Producers and Royalty Owners Association, ninth annual meeting, Hotel Texas, Fort Worth.

28-30 Western Petroleum Refiners Association, 43rd annual meeting, Plaza Hotel, San Antonio.

28-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Exploration Paleontologists and Mineralogists, annual meeting, Hotel Statler, New York.

28

April 1 American Society for Metals, 9th western exposition and congress, Pan American Auditorium, Los Angeles.

APRIL

1-3 Tenth annual Short Course on Gas Technology, Texas College of Arts and Industries, Kingsville, Tex.

5-7 Corrosion control short course, sponsored by University of Oklahoma and Central Oklahoma Section of National Association of Corrosion Engineers, University of Oklahoma Extension Study Center, Norman, Okla.

7-8 Rocky Mountain District, American Petroleum Institute, Division of Production, Gladstone Hotel, Casper, Wyo.

13-15 Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.

13-15 American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.

13-15 National Petroleum Association, 52nd semiannual meeting, Cleveland Hotel Cleveland.

18-20 American Society of Mechanical Engineers, spring meeting, Lord Baltimore Hotel, Baltimore.

19-20 Pacific Coast Gas Association, distribution conference, Phoenix.

19-21 Southwestern Gas Measurement Short Course, North Campus, University of Oklahoma, Norman, Okla.

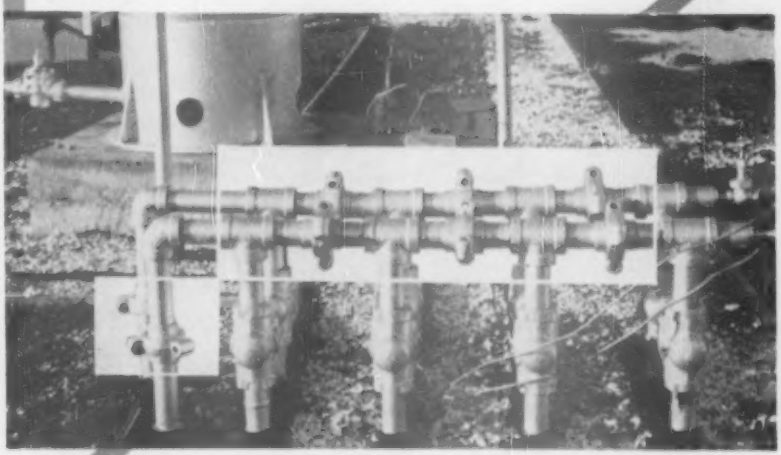
20-22 Petroleum Industry Electrical Association, annual conference, Shamrock Hotel, Houston.

25-26 Independent Petroleum Association of America, midyear meeting, San Antonio.

28-29 American Petroleum Institute, Division of Production, spring meeting of Pacific Coast district, Statler Hotel, Los Angeles.

29-30 American Association of Petroleum Landmen convention, Hilton Hotel, Fort Worth.

PERFECT CONNECTIONS



for a PRODUCTION HEADER

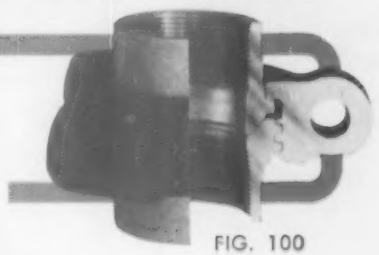


FIG. 100

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• Perfect because these WECO Fig. 100 Unions make-up easily and quickly—because their ball and cone seat seals, and stays sealed —because the "Bar-Nut" permits tightening with an ordinary bar or hammer.

Make-up your production headers with WECO Unions. Regardless of pipe size or line pressure, you can get exactly the WECO Union you need to do the job better.

Sizes: 2", 2½", 3", 4", 6", 8".

PESA

It's wise to standardize with... WECO

WECO

WELL EQUIPMENT MFG. CORP. • Division of Chiksan Company • HOUSTON 1, TEXAS

MANY AN OIL WELL PROBLEM IS SOLVED when you

Call for CAL-SEAL

U.S.G.'s SUPER-STRENGTH GYPSUM CEMENT

Recommended for SHOT TAMPS . . . LOST CIRCULATION . . . BLOW OUTS . . . SPLIT PIPES . . . BRIDGE PLUGS . . . and many other HOWCO vital services

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Howco crews, working with the newest, finest equipment, use CAL-SEAL Super-Strength Gypsum Cement to do special oil well cementing jobs quickly, dependably. United States Gypsum has been making CAL-SEAL since 1938 for super strength and stabilized, controlled set. It's teamwork like this—combining technical knowledge, expert service, and years of experience—that helps you increase production.

Halliburton Oil Well Cementing Company

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MAY

1-4	Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.
1-4	American Institute of Chemical Engineers, Shamrock Hotel, Houston.
9-10	American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.
9-12	American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.
11-12	Pacific Coast Gas Association, gas supply and transmission and conference of technical session, Palm Springs, Calif.
11-13	American Petroleum Institute, Division of Production, Eastern District spring meeting, William Penn Hotel, Pittsburgh.
12-19	Sixth Latin American Congress of Chemistry, Caracas, Venezuela.
14-22	World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt, Germany.
16-18	American Petroleum Institute, Division of Transportation, products pipeline confrence, Edgewater Beach Hotel, Chicago.
16-18	Southern Gas Association, New Orleans.
20-22	Appalachian Geological Society, Virginia Geological Survey, and West Virginia Geological Survey, spring field conference, Kavannaugh Hotel, Harrisburg, Va.
23-25	American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.
26-27	Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.
30-June 1	Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

5-9	Canadian Gas Association, annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont.
6-10	American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.
6-15	Fourth World Petroleum Congress, Rome, Italy.
6-9	Oil and Gas Power Division, American Society of Mechanical Engineers, 27th annual concert and engineering exhibit, Hotel Statler, Washington, D. C.
9-10	Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.
9-10	Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.
11-15	Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.
12-17	Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
16-18	Interstate Oil Compact Commission, Denver.
20-23	American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.
23-26	Rocky Mountain Oil Show, Casper, Wyo.
26	North Texas Oil and Gas Association twenty-fifth annual meeting, Wichita Falls, Tex.
26-July 1	American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

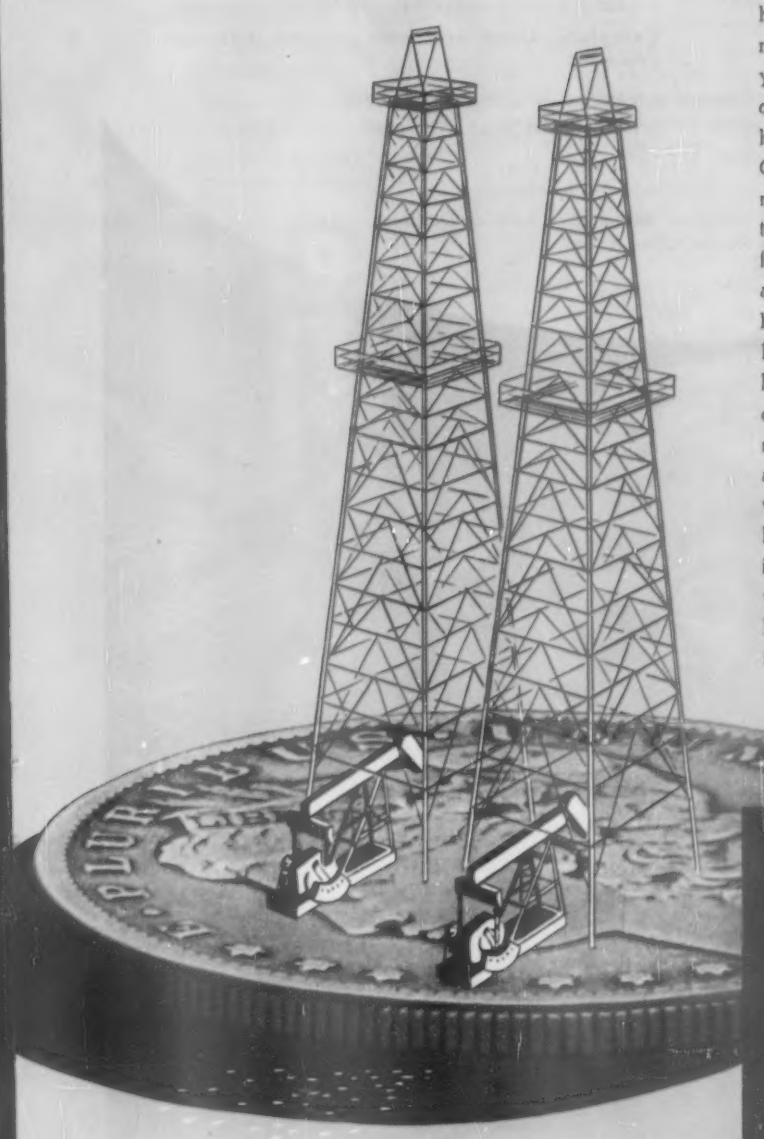
TWO OIL WELLS FOR THE PRICE OF ONE

...a most tempting proposition and one that is fast approaching an economic reality.

Dual completions in areas where productive horizons overlie one another have been commonplace for many years, but until recent years, dually completed wells were dependent on high reservoir pressure to produce the wells by natural flow.

Oilmaster Dual Zone pumping equipment makes it possible to pump simultaneously from two separate zones without comingling the fluids. Only one pumping unit and one tubing and rod string is required since the annulus between the tubing and casing conducts the lower zone fluid to the surface.

In a dually completed well, the additional cost of Oilmaster dual pumping equipment is surprisingly low. Actually, it amounts to only a few per cent of the cost of drilling a second well. If you are in an area where productive horizons overlie one another and are interested in faster payouts or higher allowables, contact your nearest Oilmaster Representative, or write Fluid Packed Pump Company for complete information on



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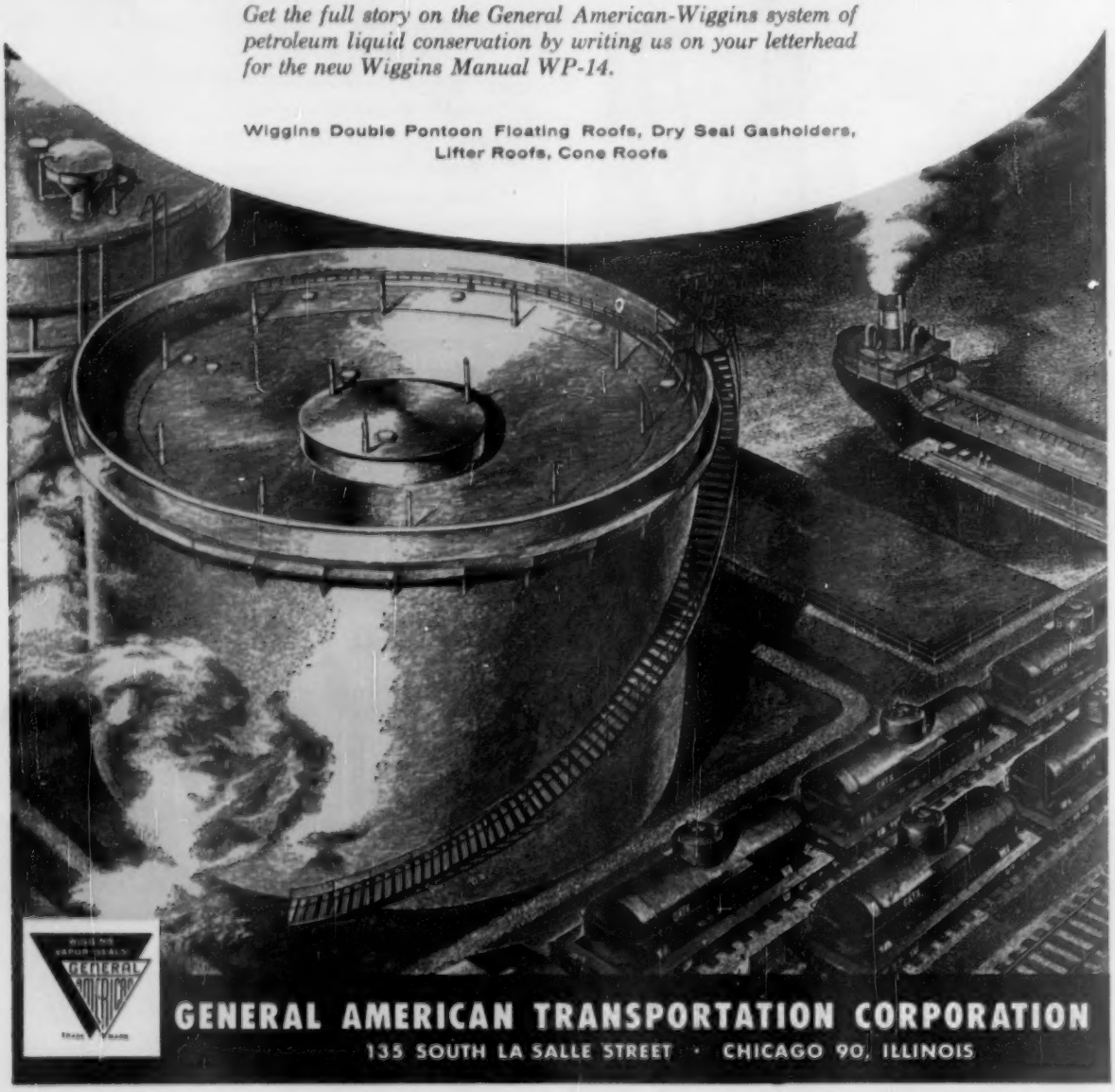

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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

Where We Came In

THE TEXAS CO. has turned the petroleum clock back 100 years. It struck oil while drilling a well for salt. That's how the oil industry got its start.

A century ago men drilled wells for brine along the upper reaches of the Ohio River, but now and then they got shows of oil. This contaminated the salt and ruined the wells. Then a smart cookie named Sam Kier found that he could distill this rock oil and make an illuminating oil which would burn in wick lamps as well as the coal oil which was then beginning to replace whale oil for lighting.

So when Colonel Drake found that he couldn't skim enough rock oil off of Oil Creek to make a respectable minimum tender to sell to Kier, he thought of the salt-well-drilling technique. He drilled a well, struck oil, and the rest is history.

Just recently Texaco had a problem of getting rid of salt water produced along with oil in an old field near Houston. It drilled a well hoping to find a stratum of brine into which it could inject its unwanted salt water. You guessed it. The well came in for 19 bbl. of oil per day from 1,418 ft.

New Deal History

WHILE we're on the subject of oil history, we recently ran across a new version, contributed by no less an authority on petroleum than Franklin D. Roosevelt, Jr., a young man who is also well known for a number of other things, the latest being his rejection by the voters as candidate for attorney general of New York.

It seems that young F.D.R. has just been elected chairman of the board of a Canadian mining company which has obtained a concession to explore for oil in Jamaica. A lengthy press release describing the venture quoted Oil Man Roosevelt thusly:

"For the benefit of all those who may follow the course of this enterprise, it must be recognized as being truly speculative. To paraphrase 'Dad' Joiner, who discovered the billion-barrel Spindletop field—'oil is where you find it, and all that I want is good country in which to dig for it'."

Thanks for this information, Junior. We had always been under the impression that Spindletop was discovered by Capt. Anthony Lucas, and that Dad Joiner stumbled on to East Texas field a quarter-century later.

Also, we were somewhat surprised to learn that Dad Joiner was capable of making the pontifical statement attributed to him. We had pictured Dad as an uneducated old roughneck, a one-gallus driller with a rig held together with baling wire, head-over-heels in debt, and asking only for more credit. Now we learn that he was a philosopher and the originator of that famous truism that "Oil is where you find it."

In his capacity as head of a mining firm as well as an oil man, Young Mr. Roosevelt ought to be impartial in his loyalties and give the mining industry credit for saying "Gold is where you find it" long before anybody began to look for oil. The oil industry got its language where it found it, and in this case it borrowed and adapted a phrase from the Forty-Niners.

But (to kick around some more phrases) all that glitters is not gold and all that looks like history is not history. To paraphrase Chairman Roosevelt: "History is where you find it, and all that I want is good sources in which to dig for it."

Making History

AND one small oil operator in Oklahoma is trying to make some history by introducing a note of formality and protocol into the drilling business. It is issuing "nontransferable identification cards" which, when properly signed by the applicant and countersigned by an official of the company, will permit the person named to visit the rig drilling its first test well.

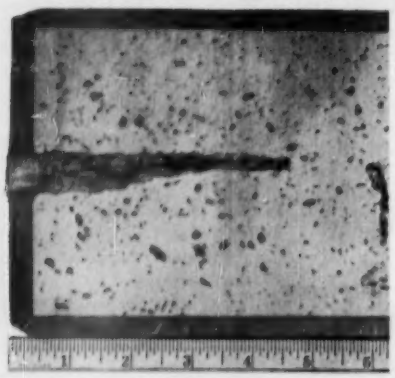
This may be a good promotion stunt, but we would hate to endure the guffaws of the drillers the first time a visitor flashed his "credentials." Except for a few tight holes guarded by shotguns, nobody has ever had to say more than "Howdy" to get on a derrick floor.

—Henry D. Ralph.

Welex

TWIN-JET

the LOW COST perforating service that gives deep, positive penetration with larger— diameter entrance holes...

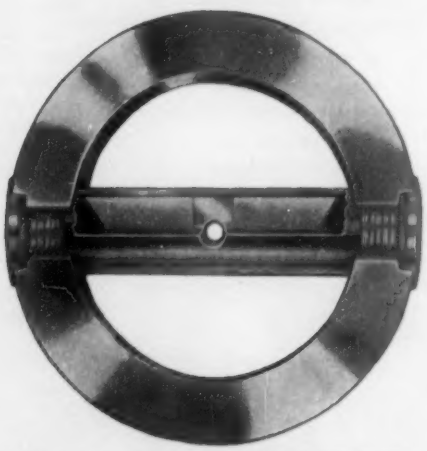


Welex 5" Twin-Jet penetrates 4.7" through ½" steel plate into aged neat cement, with entrance hole diameter of ½"!

Cross section through the Twin-Jet gun with the double jet charge in place. The jets perforate through metallic port plugs, leaving virtually no debris in the well, as port plugs and debris are retained in the gun. Visual inspection of the gun on coming out of the well reveals holes in the port plugs confirming clean perforations through the casing.

ASK YOUR WELEX SERVICE ENGINEER

The Welex technical staff is ready to help you with any well completion or servicing problem. Welex offers you experienced field crews, trained and supervised by the men who originated the Jet process.



Twin-Jet gives you POSITIVE PENETRATION of casing, cement, and formation. There are no "duds."

Average DEPTH of penetration is GREATER than with projectiles.

Entrance hole diameter is equivalent to bullets.

There is virtually no burr left on the inside of the casing.

No casing damage... no shattering of the cement sheath.

Twin-Jet Guns are made in 4" and 5" O.D., giving a hole density of 4, 6, or 8 per foot from either size gun.

Call Welex and Be Sure

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Welex

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Proration is fine— for the other fellow

UP in the Rockies a frank opponent of proration legislation likes to ask: "Proration for whose market? Oklahoma and Texas want us to prorate so they can keep their markets for crude."

That's an understandable attitude. For many years development in the Rockies was held back for lack of market outlets. Now that there are new pipelines to the East it is quite natural for Rocky Mountain producers to feel that some other area should be curtailed if the common market won't absorb all the oil available.

In Oklahoma an attempt is being made to change the law to give preference and protection to smaller wells. This would shunt the bulk of proration onto the larger, deeper wells. Independents make an appealing argument that small operators can't afford a cutback and that somebody else should curtail when the market is oversupplied.

In Texas and other southwestern states with more producing capacity than ready markets there is the same dispute over what states, and what wells within the state, should hold down output. In Illinois and California, where proration legislation has been proposed, there are similar arguments over proration for whose market.

In all states the producers ask why they should be prorated when every curtailment is offset by a bigger increase in imports.

WHOSE MARKET IS PROTECTED BY PRORATION?—the other fellow's? It looks that way to many producers. And it certainly is that way if only a small portion of the total supply is subject to proration.

The theory of market-demand proration is equitable division of the market among competing producers in times of oversupply. The "market" is everybody's market—the entire competitive area in which the affected producers seek to sell.

Production of more oil than can be consumed causes waste and demoralizes the market structure. Then every producer is hurt. So why shouldn't every producer help prevent this by carrying a fair share of the burden of proration? The burden would be small if spread around equitably.

It's a beautiful theory, but in times of oversupply—which are the only times when proration has much significance—everybody wants the other fellow to prorate. Everybody thinks that he can keep—or increase—his hunk of the market if somebody else would just stop supplying quite so much.

IT WON'T WORK. Importers can't expect domestic producers to do all the prorating. The wide-open oil states can't expect prorating states to do the whole job. One group within a state can't expect other producers to take all the cuts.

Unless everybody who shares a market also shares in balancing supply with demand, there won't be any balance very long.

Drillers put the squeeze on drilling strings, casing, tubing and costs, with the help of nickel alloy steel liners in the Baash-Ross family of slips.

Life of Slip Liners and Fishing Tools Increased by using Nickel Alloy Steel

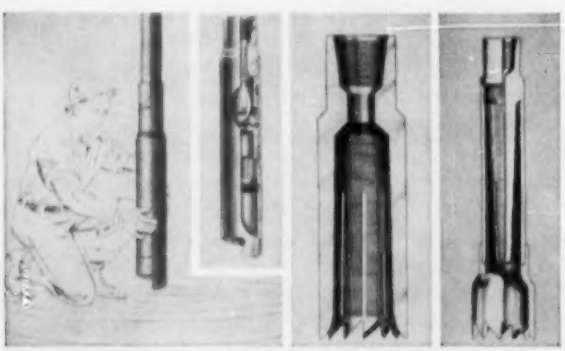
Case Hardened nickel alloy steels provide high surface hardness that resists wear, abrasion and spalling. In addition, the supporting core has ample toughness to withstand severe sudden shocks and overloads encountered by oil well tools.

That's why slip liners and fishing tools developed by Baash-Ross Tool Company of Los Angeles, California, are fabricated from carburized nickel alloy steels.

For slips that give oil men the utmost in dependability, Baash-Ross specifies liners in a nickel steel that resists torsional, tensile and compressive stresses. Resistant as well to abrasion and impact, these liners with their supporting slip bodies come in sizes to fit drill pipe, casing or tubing from 2⅜" to 20" in diameter.

Carburized nickel alloy steels play important roles in other Baash-Ross products. Their fishing tap is typical. Basically it is a long tapered thread for insertion into pipe or the like. After taking hold of the "fish", a tap is often jarred to loosen the fish before lifting it from the well. Nickel alloy steel completely meets requirements for a hard, stress-and-shock resistant tap material.

Improvement of specific properties in a steel may be obtained by the use of nickel either alone or in combination with other alloy elements. Accordingly, when you want the best set of properties for meeting your particular needs, investigate nickel alloyed steels. Whatever your metal problem, send us details for our suggestions.



Recovery of parts detached or broken off from a string calls for rotary sockets, die collars or fishing taps such as those shown above. Each combines a hard, wear-resistant surface supported by a tough core. Baash-Ross engineers find Type 4615 nickel-molybdenum steel, case hardened, meets this need. For rotary socket slips, which actually grip the fish, Type 3115 nickel-chromium steel, case hardened, is frequently specified.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

THIS WEEK . . . . . IN THE NEWS

Kuykendall wants gas act changed

FPC Chairman Kuykendall says he'll talk about his agency's regulation of natural-gas producers after the cabinet committee reports to the President. Kuykendall does have some ideas for Congress, however, on expanding FPC powers and he gave them to the House commerce committee.

Domestic producers challenge importers

Domestic oil producers challenge the position of importing companies that foreign oil is not endangering the U. S. oil industry. A dozen domestic producers appearing before a congressional committee say unrestricted imports cast a shadow of disaster over the entire industry. They are joined by the coal industry, which wants an import quota on residual fuel.

Iran's return boosts world output

World production nears 14,000,000 bbl. daily as Iranian output again becomes important. Journal survey shows Iran produced 145,000 bbl. daily in November, its first important month in 3 years. Total for the non-Communist world for November is set at 12,414,000 bbl. daily. Russia and her satellites are credited with 1,404,300 bbl. daily, bringing the world total to 13,818,300 bbl. daily.

Fracturing gives old field new life

Fracturing is reviving a veteran West Texas oil field with spectacular results. Treatment has jumped production in Ector County's Harper field from an average of 3 bbl. daily per well to as high as 70 or 80 bbl. per day in 25 wells that have been fractured.

Big crude line planned

Shell Oil Co. and Murphy Corp. will give eastern Montana a badly needed crude outlet. The two companies plan a 450-mile, 16-in. line from Baker-Glendive anticline to Guernsey and Fort Laramie, Wyo., where it will connect with Platte and Western pipelines. Construction of the line will start this spring.

Stiffer tax threatened

Colorado Gov. Ed C. Johnson is swinging a big stick. The governor says if oil men attempt to kill the state's oil and gas severance tax he will head a drive for a more severe tax. Johnson says he may even call a special session of the legislature to get a new severance levy on the ballot. The California Co. is leading the tax opposition. It plans to test the tax in court.

Drilling rate increases

Drilling contractors made hole 4 per cent faster in 1954 than the previous year and should increase this penetration rate during 1955. The A.A.O.D.C. reports the 1954 increase is the biggest since 1951. The association said the 1954 rate was made by drilling more holes with fewer rigs, a trend that is expected to continue.

Drilling with air catches on

Look for more drilling with air in the Permian basin of West Texas and New Mexico. Drilling contractors like the results they see and are following the lead of operating companies. Air drilling has already given one contractor a profit on a footage contract. Others are sure to follow. A new service company rents air-drilling equipment to smaller contractors and bigger outfits are buying air equipment.

New drilling platform completed

Mobile drilling platform capable of drilling to depths of 15,000 ft. soon will go to work for Humble Oil & Refining Co. off the coast of Louisiana. Owned by Offshore Co., the platform is designed to drill in water 100 ft. deep.

Saudi Arabia seeks gas outlets

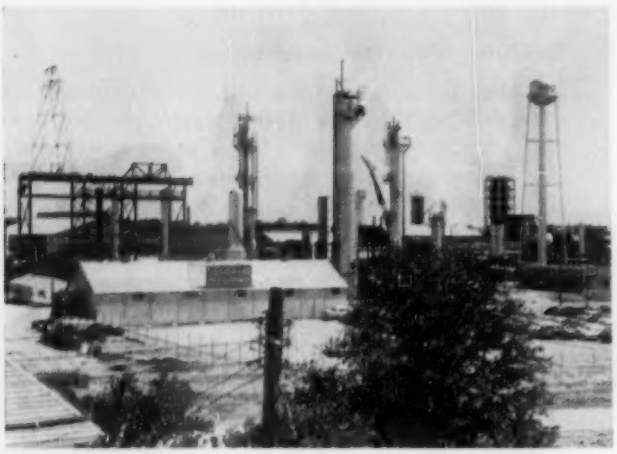
Possible use of Middle East gas now being wasted is being studied by International Development Services, New York. The nonprofit organization has an option on gas produced in Saudi Arabia. Under its agreement, the American corporation has 14 months to study possible projects using surplus gas and to raise necessary finances. Similar studies are being made in other parts of the Middle East.

Refinery in Spain to be expanded

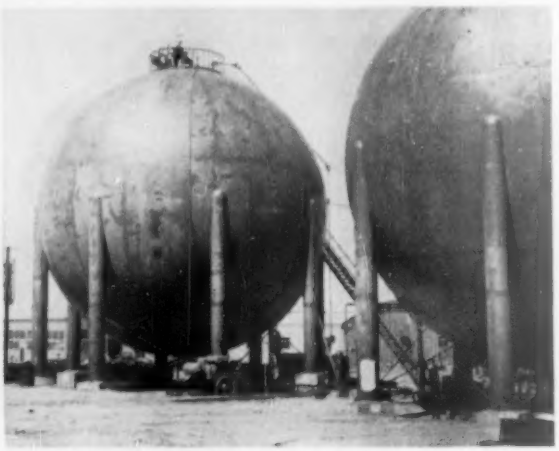
Spain plans to enlarge its refinery near Cartagena, only major refinery in the country. Long-term contracts for supply of crude have been signed with Caltex, which has 24 per cent interest in the plant, and Shell. The government recently authorized increase in throughput from 45,000 bbl. to about 70,000 bbl. daily.

DRILLING is done by some co-ops. This is a Kansas operation of Cooperative Refinery Association.

PRODUCTION of oil cooperatives totals about 10 per cent of their refinery capacity. This tank battery is on a lease in Pratt County, Kansas.



PETROCHEMICALS also provide a co-op field. This nitrogen-fertilizer plant is operated at Lawrence, Kans., by Cooperative Farm Chemicals Association.



STORAGE of anhydrous ammonia is provided at the nitrogen-fertilizer plant by spherical tanks such as these.

What's Ahead for Oil Co-ops?

- If this year is a good one for small refiners, look for co-ops to expand their operations, solidify gains
- If product prices slip, or costs rise, some co-ops will be asking themselves: Shall we quit manufacturing?

C. O. Willson

PETROLEUM cooperatives, which had a tough time in 1954, are finding things easier now.

Product prices have risen some, and if this trend continues, co-op leaders will regain their lost optimism.

The co-ops want to stay in the oil business, and they've learned a lot which will help them strengthen their position. But the past 18 months have been a particularly trying period, especially in refining.

In common with independent refiners generally, they have seen their refinery realization drop, while crude prices and other costs either held firm or went up. The situation became critical last year, and several plants lost money.

In recent weeks product prices have risen in areas where most co-op refineries are located. As a result, the outlook has improved.

If product prices slip again, however, it will raise the basic question of whether, in many cases, refineries are a desirable and necessary part of co-operative oil operations, which primarily are concerned with the efficient distribution of a wide variety of consumer products.

Competitive free-for-all . . . The 1954 crisis, with its lower product prices and higher operating costs, has resulted in a competitive situation in which the orderly purchase of refinery output by local and regional co-ops has not been carried on as in the past.

In what has been described as a "free-for-all," the co-ops have often

REFINING is the major field of cooperatives in the petroleum industry. Shown here is the 25,000 bbl. plant of Consumers Cooperative Association in Coffeyville, Kans. The refinery was bought in 1944 and has since been expanded.

DISTRIBUTION was the field of activity which created the cooperatives, and still is its principal function. Other fields were entered primarily to guarantee a supply of needed products.

bought from privately owned refineries because the prices were lower. This has thrown large amounts of co-op products on the spot market at bottom prices.

Except where there are long-time contracts, regional and local co-ops can usually purchase wherever they see fit and do so despite the fact that they are financially interested in some form in one or more of the co-op refineries.

Co-op managements hope this situation will correct itself with a return to more normal marketing conditions.

1. What Is Involved

There are now 30 important regional associations which supply oil products either from their own refineries or through purchases from privately owned plants.

They serve more than 2,500 local co-ops and, in addition, sell large amounts to independent jobbers, dealers, and other buyers. The bulk of the products are finally sold to farmers, and officials estimate that the local co-ops supply approximately 20 per cent to the farmers in the areas where they operate.

Exactly how much crude oil is now produced by the regional associations is not known. Four years ago it was slightly in excess of 15,000 bbl. daily, and there has been no large increase since that time.

As of the first of the year the associations were operating 16 refineries with two plants shut down. The accompanying table shows that these plants had a crude-oil capacity on March 1, 1954, of 174,600 bbl. daily or about 2 per cent of the total capacity of all refineries in this country.

Several of the refineries have been enlarged and modernized in recent years. Their combined thermal and catalytic cracking capacity in relation to crude-oil capacity, compares favorably with the national average. In addition, several have reforming and polyforming units and one refinery manufactures lubricating oils.

Sales of petroleum products distributed by co-ops now total about 50 million barrels yearly. This is roughly equal to the refinery output.

How they grew . . . The first distribution of gasoline by a local co-op took place at Cottonwood, Minn., in July 1921. It came at a time when profit margins for distribution were wide and it was possible for the seller to cut wholesale and retail prices, and still have a co-op profit.

Other co-ops were quick to see the possibilities. By 1928 a total of 98 co-ops in Minnesota, Wisconsin, and Iowa were selling oil products.

These local co-ops soon learned they could strengthen their positions by combining their purchases. Out of this realization came the regional associations. The first association, the Midland Cooperative Association, was organized in 1926 and is now one of the larger units.

Other associations quickly followed. While the co-op movement was originally designed to help farmers and fruit growers sell their products, federal and state legislation in the twenties and thirties, supported by court decisions, broadened the activities. The new laws allowed manufacturing and buying as well as selling and resulted in large-scale operations outside of agriculture.

The marketing of petroleum products was of great aid to the cooperative movement centering in the Middle West during the thirties. There were instances in which the handling of petroleum products became the most profitable phase of a co-op's varied activities and helped finance a steady growth. Organizers of local and regional groups were thus able to stress to prospective members the favorable returns assured in the handling of petroleum products.

Co-op Example . . .

. . . and Philosophy

USUALLY cited as the best petroleum co-op operation, and one which typifies the objectives of all similar co-ops, is Consumers Cooperative Association of Kansas City.

This organization has 1,662 member units. Its latest annual report shows that it produces an average of 5,347 bbl. daily, processes 30,000 bbl. daily in three refineries. It also owns a third of National Cooperative Refinery Association, whose McPherson, Kans., refinery averaged 21,700 bbl. daily.

Last August the company and its associates completed a nitrogen-fertilizer plant at Lawrence, Kans., said to be the largest single facility ever built by a cooperative. It is operated under the name, Cooperative Farm Chemicals Association.

In any study of cooperative activity, it is necessary to keep in mind that it includes a social philosophy that is more important than commercial considerations to many of its leaders.

This attitude was expressed by Howard A. Cowden, C.C.A. president and best-known co-op figure, when he said in the latest annual statement:

"All too often . . . we tend to think of our 'co-ops' in terms of physical ownership. But there is more to consider. Beyond your local retailer association, beyond plants and pipelines, the trucks and warehouses of your regional, is an idea that transcends the sheer economics of cooperation."

Operating Refineries of Co-op Associations

Regional unit, its refining subsidiary or division, and location of refineries—	Capacity, (bbl. daily) Crude oil	Cracking Thermal	Cracking Catalytic
Consumers Cooperative Association-Cooperative Refinery Association:			
Phillipsburg, Kans.	8,000		4,250
Scottsbluff, Neb.	2,200	1,000	
Coffeyville, Kans.	25,000	4,500	6,500
Indiana Farm Bureau Cooperative Association, Refining Division:			
Mount Vernon, Ind.	9,500	3,000	3,750
Farmers Union Central Exchange, Independent Refining Division:			
Laurel, Mont.	15,000	5,000	6,000
M.F.A. Oil Co., M.F.A. Refining Division:			
Chanute, Kans.	2,000	1,200	
Delta Refining Co.:			
Memphis, Tenn:	6,200	1,200	3,000
Midland Cooperative Wholesale, Refining Division:			
Cushing, Okla.	12,000	6,000	4,500
National Cooperative Refinery Association:*			
McPherson, Kans.	26,000	3,000	11,000
(Ohio) Farm Bureau Cooperative Association-Louisville Refining Co.:			
Louisville, Ky.	7,000	2,500	3,300
Premier Petroleum Co.:†			
Longview, Tex.	4,200	2,200	
Fort Worth, Tex.	7,500	2,200	3,000
Baird, Tex.	2,500	1,200	
Illinois Farm Supply Co., Pana Refining Division:			
Pana, Ill.	6,000	2,200	
Utah Cooperative Association-Uinta Oil Refining Co.:			
Jensen, Utah	1,500		
Texas City Refining, Inc.:‡			
Texas City, Tex.	40,000	4,000	17,500
Total	174,600	39,200	62,800

SHUTDOWN REFINERIES

Consumers Cooperatives Associated-Consumers Cooperatives Refinery Association:
Levelland, Tex.
Premier Petroleum Co.:
Arp, Tex.

*Owned by the Farmers Union Central Exchange, St. Paul, Minn.; Central Cooperative Wholesale, Superior, Wis.; Midland Cooperative Wholesale, Minneapolis, Minn.; Farmers Union State Exchange, Omaha, Neb.; and Consumers Cooperative Association, Kansas City, Mo. †Owned by Farmers Union Central Exchange, Midland, Cooperative Wholesale, and Illinois Farm Supply Co., Chicago, Ill. ‡Owned by Cooperative G.L.F. Exchange, Pennsylvania Farm Bureau Cooperative, and Southern States Cooperative.

2. Co-ops in Refining

The co-ops entered refining because they felt they could protect their marketing operations only by producing at least part of their requirements. They had previously profited from the compounding of lubricating oils and greases. The first plant was built at Phillipsburg, Kans., in 1940 by the Consumers Cooperative Association of Kansas City.

About the same time, refinery markets began to strengthen, and when all petroleum prices were frozen after our entry into war in December 1941, there was generally a favorable spread for refiners between the cost of crude and the prices of products. Other associations bought refineries during the war period.

During the postwar shortages prices were satisfactory to refinery operators. This situation continued through 1948, despite advances in crude-oil prices. The records show that two refineries were built or acquired in 1940, one in 1941, five in 1943, two in 1945, and 10 in 1948.

Postwar expansion . . . While the original motive of the cooperative entry into refining was largely to protect profitable distribution, other factors later entered into the record expansion in 1948.

Some of the refinery purchases made by cooperative associations in that year were primarily for investment purposes. The buyers absorbed little of the output of the plants, which continued to sell to buyers not associated with cooperative operations. The refinery margins at that time pointed to quick payouts to the buyers.

Market conditions changed quickly in 1949, when supplies increased and demands leveled off. Refinery realizations dropped as much as $1.00 per barrel and many operations were in the red.

Conditions improved with the enlarged world petroleum demands resulting from the Korean emergency starting in 1950. But it is noteworthy that there have been no additional purchases of refining facilities of domestic refineries by co-ops since 1948.

Financing the growth . . . Over the past few years, with shortages eliminated, refining and marketing operations have become increasingly competitive both in price and quality of products.

To keep pace with the quality race centering on gasoline and resultant changes in processing methods, large expenditures have been necessary. While some of the growth has been financed from current earnings, large new capital outlays have been necessary.

A part of the new financing for all types of co-op activity has come from loans of the Bank of Cooperatives, which became a government-sponsored agency in 1933. This bank, which has several branches throughout the United States, in general loaned funds at lower interest rates and was in a position to

take risks on loans not acceptable to the usual commercial sources.

But so large have been the new capital requirements that some associations have found it necessary to do outside financing, including common and preferred stocks, commercial bank loans, bonds, and debentures.

At the close of 1950, investments of the cooperatives in the oil business totaled $186,438,500, according to a government report. The breakdown by divisions was: distribution 35 per cent; producing, 22 per cent; refining 21 per cent; transportation, 20 per cent; and miscellaneous, 2 per cent. Those in close touch with conditions state that the percentage positions of the divisions except for a small increase in refining percentage have not changed since 1950.

3. Crude and Pipelines

Investments in crude-oil production started shortly after the first refineries were acquired by the associations.

This activity came about because of the feeling that the associations should have production of their own to support refinery operations. Most of the purchases were made in Oklahoma, Kansas, and Texas for settled operations. Some associations have exploratory as well as production departments. It is estimated that at present owned production takes care of about 10 per cent of the total refinery requirements.

In transportation most of the inland refineries are connected to product-pipeline systems and two refineries have product lines of their own.

They own all the usual facilities of the inland waterways and tankers for coastwise movements. The associations own several hundred miles of crude-oil lines, usually adjacent to their refineries. Some of the plants obtain part or all of their crude-oil supplies from the major crude-oil producers and buyers who make deliveries through pipeline affiliates.

4. Taxes and Policy

The position of petroleum cooperatives in the matter of federal income-tax exemptions is a matter of dispute. Originally, profits or "savings" were returned in cash to members on a basis of their participation as consumers. Any income tax was paid at the rates applying to thousands of consumers.

The operations have now become so complicated that an analysis of each association's activities would be necessary before a fair appraisal of tax position could be made. Some of the operations have a preferred income-tax position. Others do not. This has to do in part with whether the association or unit thereof operates exclusively within the framework of a co-op or whether part of its sales are to nonmembers.

In recent years the practice of many associations and local organizations in lieu of cash has been to pay refunds in the form of capital stock, issuance of certificates of equity, or some other form retaining the earnings in the organization to aid in financing expansion. It appears that income-tax exemptions have become less and less important in cooperative operations in recent years.

Management policy . . . There appears to be general agreement that further co-op success will be dependent on whether or not the regional organizations are willing to recognize the operating conditions peculiar to the petroleum industry and adjust their activities accordingly.

This involves not only the details of operation but also the matter of adequate risk capital and the plowing back into operations of 50 or more per cent of any profits over a long period.

In most cases the association policies are determined by boards of directors who are more familiar with agricultural activities and retail policies than they are with producing and manufacturing operations such as those of the oil industry. The answer to this situation, it is contended, is to recognize this condition and to establish separate petroleum departments, adequately financed, and staffed with full authority to act.

Industry Briefs

LONG BEACH.—The earthquake at Long Beach Harbor late in January damaged 43 oil wells so badly they will have to be redrilled. Cost of redrilling the wells will be about $3,000,000. The wells have a daily output of 2,500 bbl.

SAN FRANCISCO. — Standard Oil Co. of California plans to spend more than $300,000,000 in 1955 for capital and exploratory purposes. This will be the most the company has ever spent in one fiscal year. Similar expenditures in 1954 were nearly $275,000,000. More than half of the amount will be to explore for new oil and to develop present properties.

NEW YORK.—Standard Oil Development Co. has changed its name to Esso Research & Engineering Co. The Standard Oil Co. (N. J.) affiliate made the move to more clearly identify its activities as the research and engineering arm of the company.

AUSTIN.—Llano Grande Corp. has asked the Texas Railroad Commission for permission to create four underground L.P.G.-storage cavities near its new plant in Cochran County, Texas. The cavities would have a capacity of 2,000,000 gal. each. They would be leached out of a salt formation at about 2,150 to 2,900 ft. The company expects to recover about 98 per cent of the L.P.G. stored.

NEW YORK CITY.—Witco Chemical Co., of New York City, has acquired a half interest in Ultra Chemical Works, Inc., Paterson, N. J. Ultra produces waxes and other chemical specialties at its plants in Paterson, Joliet, Ill., and Los Angeles.

VANCOUVER. — Stockholders will meet in the near future to vote on whether to merge Alberta Pacific Consolidated Oil, Ltd., and Sunset Oils, Ltd., according to J. Cowan Adam, president of both firms. Stock will be exchanged on a share-for-share basis if the firms merge.

OLNEY, Ill. — Calvert Drilling Co. and Calvert Exploration Co. have merged into Calvert Drilling, Inc., of Olney, Ill. F. A. Calvert, Jr., president of Calvert Drilling, announced that the transportation division, formerly a partnership with Noel Everett, had been purchased by the company. Everett will continue with the firm as general manager of the division. The company owns 12 rotary rigs and production in Illinois, Oklahoma, Colorado, and North Dakota.

CASPER, Wyo. — Stanolind Oil & Gas Co. moved its Denver-Julesburg basin area office from Kimball, Neb., to Brush, Colo., last week. The move was made because of Stanolind's growing activities in the northeastern Colorado portion of the basin, where the company plans to drill about 50 wells this year. Stanolind has leases on about 2,225,000 acres in the basin.

SAN FRANCISCO.—The name of Richmond Petroleum Co. of California, subsidiary of Standard Oil Co. of California, has been changed to California Exploration Co.

CALGARY.—Pure Oil Co., Chicago, will open offices in Calgary within a short time. The company's Canadian program will be headed by K. A. Mygdal, Wynnepka, Ill.

In Permian basin, they . . .

Drill Faster With Air

Edwin McGhee

MIDLAND.—Drilling contractors in the Permian basin of West Texas and New Mexico are taking a new look at air drilling.

They like what they see and here are some of the reasons:

. . . **Faster penetration** of air drilling gave one contractor, Brantly Drilling Co., Midland, a profit on a footage contract.

. . . **Air, aerated water, or aerated mud** are being used by at least three operators in the area to fight loss of circulation.

. . . **One large contractor** is buying equipment for air drilling.

. . . **Smaller contractors** are renting compressors, rotating heads, and manifolds from a new service company.

In recent months, air has been used to drill hard-rock sections of several wells, core an oil sand, drill into a weak pay zone, and to get through cavernous formations. One company even spudded a well with air.

Operators led the way . . . Drilling men have long agreed that air or gas drilling is faster than mud and makes bits last longer. But it took the operating companies to prove it.

Contractors drill for profit. They couldn't afford to experiment unless operating companies were willing to shoulder the risk. The operators tried air drilling to reduce costs, and now that enough holes have been air drilled to show it is practical, contractors are looking at it as a way to meet competition.

In the past there have been three objections to air drilling on footage contracts:

. . . **No way to shut off** water coming into the hole.

. . . **A shortage** of equipment.

. . . **No one knew** much about it.

Each of these points is being overcome.

Shutting out water . . . The biggest drawback, water shutoff, is being attacked by the research of several companies. One new water-blocking agent will probably come on the market within the next few months. Others may be ready before the end of the year. The agent will probably be dumped into the hole and squeezed by air pressure into the pore spaces of the water zone. It would block permeability and stop water.

Operators and contractors in the Permian basin who are trying air drilling are sure that it is only a question of time until they can control water from all but the very strongest water sands.

Even if no means is found to control water, air drilling will be profitable for plenty of holes. The harder the rock drilled, the more likely air will make a saving. Air drilling could be started on many wells after the salt string is set at about 4,000 ft.

Equipment in the field . . . No equipment has been available for air drilling because there has been no demand for it. Now that there is a demand the price is discouraging. A contractor who cannot foresee a steady use for compressors can't afford to buy them for himself. To fill this need, Technical Drilling Service, Inc. of Midland was formed. This company rents its compressors, rotating heads, and manifolds on a day basis. A similar company, Well Completions, Inc., Denver, has been operating in the Rockies for about 2 years.

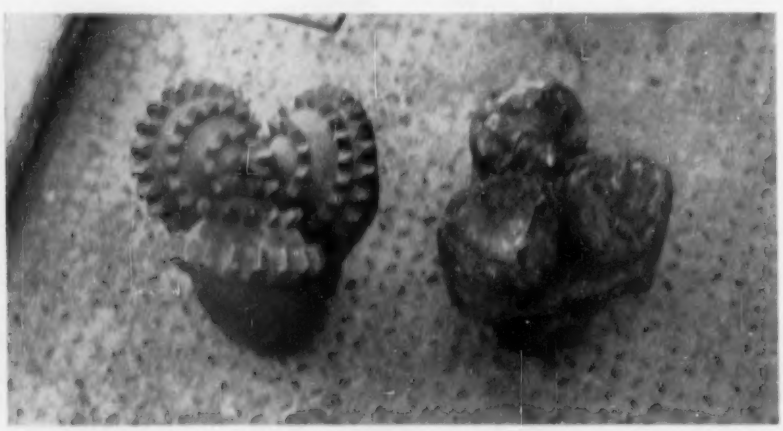
Drilling in and workover . . . Besides speeding up drilling and helping with loss of circulation, air has other prospects. It can be used to core, drill into, or work over weak pay zones.

In effect, air is giving back to the rotary driller some of the advantages lost when he turned away from cable tools. As in cable-tool drilling, the driller using air knows exactly when he tops the pay formation. There is no danger of mudding off the formation, and production tests are practically automatic.

In remedial work, air removes any fill in the bottom of the hole without contaminating the pay zone.

Humble Oil & Refining Co. used air to core into an oil zone in Lea County, New Mexico. They got better cores. In the Cap Rock field, also in Lea County, air has been used several times to drill into the Queen sand.

One sidelight of drilling into oil zones is that the temperature of the air must be watched carefully. If the air is too hot, it will strip the light ends out of the oil, and leave an asphaltic deposit in the hole and on the drill pipe. But, good intercoolers and aftercoolers will lower the temperature so that stripping is no problem.



THESE TWO 8¾-IN. BITS were used by Brantly Drilling Co. drilling hard rock with air in Lea County, New Mexico. The bit on the left made 780 ft. in 28½ hours. The teeth were still in good shape and it was only slightly out of gage. The one on the right made 613 ft. in just slightly less than 28 hours with 10,000-lb. weight. It was still making a foot of hole every 6 minutes when it was pulled. The bit was not pulled because the contractor thought it was dull.

Deepest Texas Test Dry

DALLAS.—The deepest well ever drilled in Texas found the Ellenburger dry at its record depth of 18,673 ft.

Hunt Oil Co. 47 Elsinore Royalty Co., 6 miles southeast of Chancellor, went 64 ft. below the 18,609-ft. mark set last September by Gulf Oil Corp. in its 1 P. G. Northrup, 30 miles to the northwest. The Hunt well snapped the record in mid-January *(The Oil and Gas Journal, January 24, page 71)*.

Hunt Oil released Penrod Drilling

Co.'s rig last week when the well was plugged back to test the Permian and swabbed only sulfur water. The Permian was tested through perforations from 3,810 to 3,920 ft. after a drill-stem test of the Ellenburger from 18,597 ft. to bottom. The Ellenburger test recovered 9,000 ft. of water blanket and 2,250 ft. of jelled mud.

A sister well to the deep duster, Hunt's 48 Elsinore Royalty Co., was drilling at about 650 ft. last week 13 miles to the southeast. This wildcat also will go to around 18,000 ft.

Gas Tax Proposed

Texas measure would hit interstate pipeline firms

AUSTIN.—The Texas Legislature is again drawing a tax bead on interstate gas pipeline companies.

Rep. Curtis Ford, Jr., Corpus Christi, has introduced a bill which would levy a tax of 1 cent per M.c.f. of natural gas produced under contracts of more than 1 year's duration.

This is the so-called "dedicated gas reserves" tax proposed by the Texas Senate in 1951 but shelved for the "gas gathering tax" later declared unconstitutional by the United States Supreme Court.

The tax would be levied against the "beneficial owner" of the gas, described in the bill as the person other than the owner of the mineral lease who acquires title to it under a contract covering a period of more than 1 year.

The tax would apply to produced gas after it has been processed for L.P.G. It would not tax that returned to the reservoir.

The bill covers cases in which a pipeline company produces its own gas by providing that the holder of the mineral rights would pay the tax if there is no beneficial owner.

It would require the producer of a gas well to report to the state comptroller:

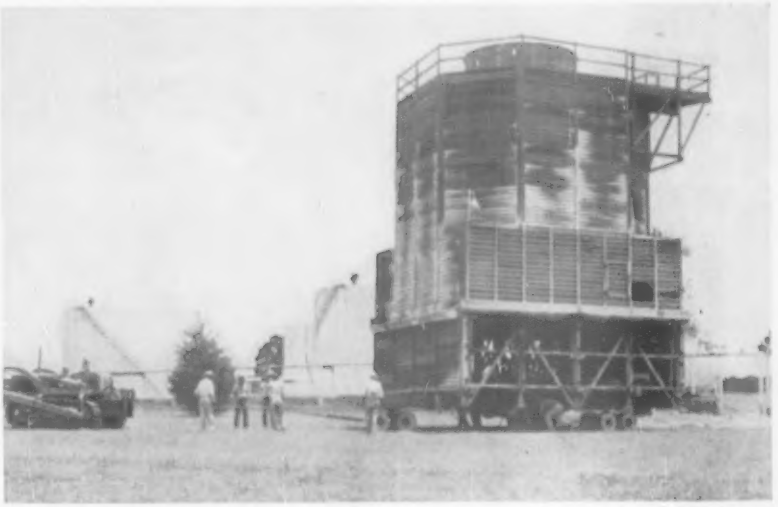
... **Amount of gas produced** by the well during the preceding calendar month.

... **Identification** of any beneficial owner.

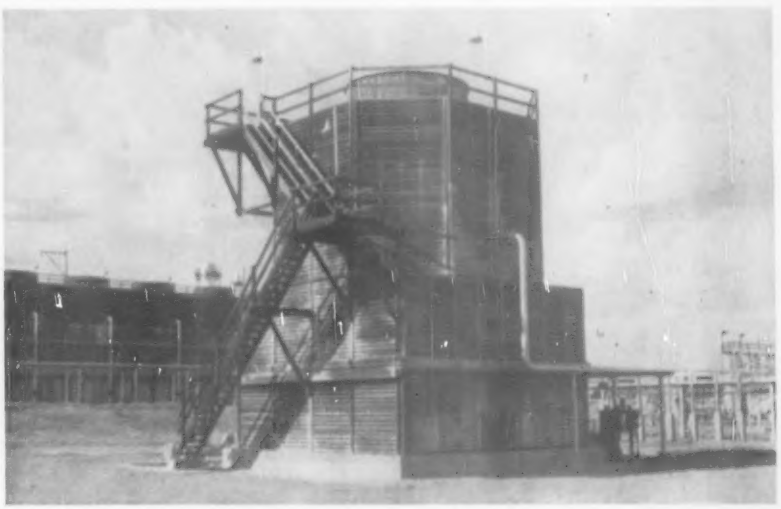
... **Name and address** of the owner of the mineral rights.

... **Volume returned** to the reservoir, if any, and any other information required by the comptroller.

Legislators who might ordinarily be against such a move may be influenced by the state financial picture. Treasury officials have estimated that between $60,000,000 and $70,000,000 will be needed in the next 2 years just to maintain the present rate of state spending.



United Skips Dismantling . . .



. . . Skids Big Cooling Tower

CARTHAGE, Tex.—If there's a short way to do something, gas men will no doubt find it.

A case in point occurred recently at United Gas Pipe Line Co.'s big Carthage field gasoline plant in East Texas.

When United enlarged its compressor station here, the existing cooling tower had to be replaced with a larger one. It was found, however, that the old facility—a 24 by 24 by 36-ft.-high induced-draft tower equipped with coil shed to house atmospheric sections of the gas coolers—could be used at another location 1,200 ft. away.

The company decided to skip the usual dismantling and reassembling procedure and to move the 104,000-lb. tower in one piece.

The lower section of the unit was braced and cross-braced, then the whole caboodle jacked up and deposited on an A frame composed of 12 by 12-in. running sills. Dollies were placed under the apex and the legs of the A frame and the tower was towed across the plant site to its new location.

Most of the route was over a gravel road. Ditches and uneven areas were negotiated using wooden planking. In a few places, elevated flare lines were cut temporarily to permit the tower to pass.

Concrete supports and the base of the concrete basin at the new location were readied prior to the actual move. Walls of the basin were poured after the tower was in place.

Veteran Texas field gets . . .

. . . Revival by Fracturing

Edwin McGhee

ODESSA, Tex.—Harper field of Ector County, Texas, just west of here is staging a comeback with fracture treatments. So far 25 wells in the old field have been fractured. The results have been spectacular.

In August 1954, when the first well was treated, average production in the field was about 3 bbl. per day per well. After treatment, the wells have been coming in at as much as 140 bbl. of oil per day. They settle down after several months at rates as high as 70 to 80 bbl. per day.

The wells are fractured with either lease crude or refined oil and about 1½ or 2 lb. of sand per gal. of oil. Most treatments use 20,000 to 30,000 gal. of oil. One operator is using 40,000 gal. of oil and 60,000 lb. of sand per treatment.

Injection rates are high, averaging 35 to 50 bbl. per minute.

San Andres pay . . . The fractured wells in the Harper field are producing from the San Andres, a brown and white dolomite with thin streaks of bentonitic shale. Top of the pay averages about 4,050 ft. and average thickness is 170 ft. The field itself is a poorly-defined anticline, trending northwest and southeast on the east rim of the Central Basin platform.

Discovered in 1933, the field was slow developing. Almost all the wells were drilled in 1937 and 1938 and the field had 167 wells at the end of that time. The rapid decline in production apparently discouraged further drilling; so that only a few more were drilled. In June 1954, the total was only 179 wells.

Those wells were pumping an average of 3 bbl. of oil per day per well. Cumulative production to Oct. 1, 1954 was only 11,951,000 bbl., or 65,000 bbl. per well. About 31,000,000 M.c.f. of gas had been produced. The per acre recovery was very low, 3,150 bbl. per acre.

First treatment . . . The first well fractured in Harper field was making only 1.5 bbl. of oil per day. Five months after treatment, the well is averaging 30 bbl. per day.

Some wells on the edge of the field have responded strongly to fracturing, making 120 to 140 bbl. of oil per day. However, these edge wells generally are falling off rapidly, and stabilizing at about 20 to 30 bbl. per day. Even at that rate, payout of the fracture treatment is rapid.

The wells that receive the big 40,000-gal. treatments seem to be holding up better than most others. Complete failure has been rare.

L.P.G. Storage Approved

AUSTIN.—Stanolind Oil & Gas Co. has a permit from the Texas Railroad Commission to store a propane-ethane mix in the gas cap of the Old Ocean (Armstrong) reservoir in Brazoria and Matagorda counties.

The company is producing about 2,000 bbl. of propane-ethane mix a day for which it has no market. It plans to inject L.P.G. from its Old Ocean gasoline plant into the gas cap of the reservoir from 9,955 to 9,970 ft. in an area not yet swept by dry gas under the cycling program.

MID-CONTINENT

Producers Protest

Oklahoma proration bill hits snag in committee

OKLAHOMA CITY. — Bills before the Oklahoma Legislature to force higher crude production in the state met strong opposition from large and small producers at committee hearings this week.

The bills would prohibit the Oklahoma Corporation Commission from limiting the production of any well below 25 bbl. per day for any reason. This minimum would prevail 365 days per year and would be applied on a lease basis. That is, all wells on a single lease would be permitted to average 25 bbl. per day.

Earlier both house and senate committees heard support for the proposal from smaller independent producers. They argued that the 25-bbl. minimum would increase Oklahoma's production and consequently the market for its oil, and would provide much-needed income both for small producers and for the state treasury.

Opponents argue:

. . . Conservation regulations should be kept flexible, and the corporation commission's hands should not be tied by such a legislative restriction.

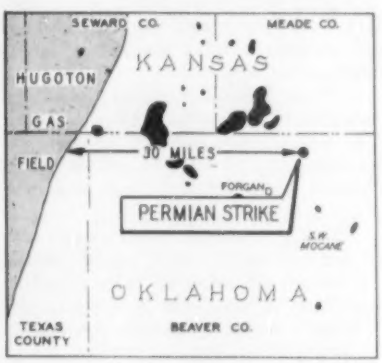
. . . Increased production would not force refineries to buy more Oklahoma crude.

. . . Production would increase so much that some sort of proration would be imposed soon—either pipeline proration by purchasers or market-demand proration by the commission.

. . . If the commission attempts to keep the state's production in line with demand, proration will fall on wells now having allowables higher than 25 bbl. per day, primarily deep wells. This would discourage deep drilling and new exploration.

. . . Without any penalty for high gas-oil ratios, some wells would waste gas and upset the balance of fluids in the reservoir.

. . . No other state assigns allowables on a lease basis. To do this would permit a good well on a lease to produce several times 25 bbl. per day while draining an offset on the next lease which was held to the 25-bbl. minimum.



Permian Surprise

Prospective gas discovery 30 miles east of Hugoton

TULSA.—Permian gas production is indicated at a Beaver County, Oklahoma Panhandle, wildcat more than 30 miles east of nearest such pay.

Lion Oil Co. 1 Hodges, 5 miles northwest of Forgan and 6 miles northwest of Mocane field (Morrow and Mississippian production), flowed 392 M.c.f. of gas per day on drill-stem test at 3,130-96 ft. Pay section is in the Council Grove group of the Permian Wolfcamp.

Discovery of Permian gas this far east of Hugoton gas field is the most surprising wildcat event of the new year in the Hugoton embayment. Drilling emphasis in the past few months has been on the pre-Permian zones of the vast western Oklahoma and Panhandle area.

Production in Hugoton field is from the Chase group of Permian age at about 2,600 ft.

Williston Line Planned

Shell and Murphy will join to build 450-mile outlet from eastern Montana; hookup with Platte, Western proposed

GLENDIVE, Mont.—A pipeline outlet for oil produced in eastern Montana will be built this spring by Shell Oil Co. and Murphy Corp.

The two companies have agreed to build the line, but details are not determined. The line will run almost straight south into eastern Wyoming where it will connect with existing crude lines feeding into refining centers in the Missouri area.

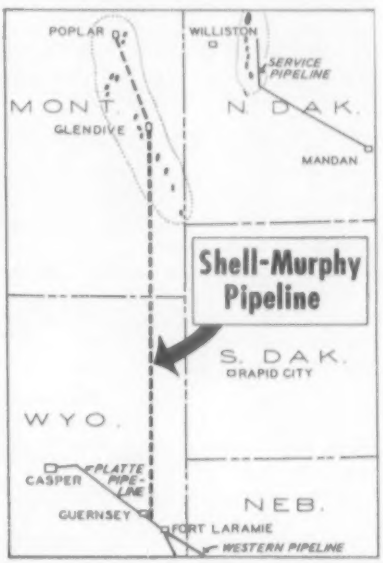
A new company, not yet named, will be formed to own and operate the line. Shell Pipe Line Corp. is expected to do most of the engineering. The line will be mostly 16 in. in diameter, and approximately 450 miles long.

Shell and Murphy are the largest producers in eastern Montana. Murphy is operator of the East Poplar unit in the northeast corner of the state. Shell has a major interest in several of the string of fields along the trend of the Baker-Glendive anticline stretching from the town of Glendive, Mont., southeast into the tip of South Dakota.

The new line will serve the Poplar and Glendive areas and will connect with the Platte pipeline at Guernsey, Wyo., and with the Western pipeline (Service Pipe Line Co.) at Fort Laramie, Wyo. Service owns the only other major crude line in the basin. It runs from northwest North Dakota to the Standard Oil Co. (Ind.) refinery at Mandan.

Alternate route . . . Some thought is being given to routing the line through South Dakota east of the Black Hills or through Rapid City, S. D. In this case it might connect with Platte or Western east of Guernsey and Fort Laramie. A newly organized firm, Great Plains Refinery & Development Co., has announced plans to build a 3,000-bbl. refinery at Rapid City *(The Oil and Gas Journal, November 15, 1954, page 165).*

Area involved . . . There are 14 fields in eastern Montana with a production of about 17,000 bbl. per day. East Poplar produces more than 10,000 of this. All of this crude reaches refineries by railroad tank car—an expensive haul which yields a low netback at the wells. Production in the area undoubtedly will be increased when a pipeline outlet is available.



Past proposals . . . This is the latest of several pipeline projects proposed for the western part of the Williston basin during the past couple of years.

Shell and Murphy were considering several alternate schemes in the fall of 1953 *(The Oil and Gas Journal, September 21, 1953, page 152).* Later these two firms spearheaded the planning of 12 companies in what became known as the Sioux pipeline project, a proposal to build a big-inch line from Saskatchewan and Montana to Chicago by way of Minneapolis.

The Sioux project was dropped when some of the participants decided to move Saskatchewan crude to Minneapolis through connections with the existing Interprovincial pipeline *(The Oil and Gas Journal, April 5, 1954, page 67, and May 17, page 83).*

Several other projects, including a line west to Billings, Mont., were proposed by various interests, but none received full support from either producers or refiners.

More recently a group organized by Wiley F. Moore, Jack Frost, and others announced plans to promote a pipeline from Glendive to Guernsey where it would connect with other lines proposed by the same group running through Denver, Colo., and Albuquerque, N. M., to Phoenix, Ariz. *(The Oil and Gas Journal, September 13, page 91).*

Spacing Orders Issued

DENVER.—Forty-acre spacing has been ordered by the Colorado Oil and Gas Conservation Commission for oil wells drilled to the "D" sand of the Little Beaver-East field in Washington County.

Similar spacing was established for the "D" sand of the Dakota series in the Northwest Graylin field in Logan County.

Bill Excludes Oil Men

HELENA, Mont.—Oil men would be barred from membership on the Montana Oil and Gas Conservation Commission by a bill before the state house of representatives.

The measure would remove two oil industry members from the 5-man commission.

Rep. Charles Cerovski, Fergus County Democrat and co-sponsor of the proposal, charges some of the "confidential information" available to the commission "possibly has leaked out to parent companies" of oil commissioners.

He says "laymen members also would look at oil conservation problems with a more open light" than oil industry members.

Water Flow Threatens Rig

MALTA, Mont.—A rotary rig drilling an oil test in northeastern Montana struck hot sulfur water instead.

The 105° water blew out of the 1 Ulrich, 10 miles southeast of here, from a depth of 3,500 ft. and has been flowing 50,000 bbl. daily for 2 weeks. Blowout preventers stopped the flow, but the water channeled and punched through the surface in geysers as far as 50 ft. from the rig.

The rig, threatened with undermining, was beink skidded off the location last week by DeKalb Agricultural Association, which is drilling the well.

Crude Pipeline Completed

DENVER.—An 8.1-mile crude pipeline from the Gebo field in Hot Springs County to Continental Oil Co.'s Chatham, Wyo., pump station has been completed and placed in operation.

The 6-in. line was built by the Platte Pipe Line Co. at a cost of $183,000. It connects with a Gebo field gathering system operated by Continental Pipe Line Co., subsidiary of Continental Oil.

Industry Warned

Governor threatens stiffer severance tax for Colorado

DENVER.—Gov. Ed C. Johnson warned the Colorado oil industry last week not to try to overthrow the state's oil and gas severance tax.

If the industry challenges the 2-year-old tax in the courts, Johnson said he will take immediate steps to refer a more severe tax to Colorado voters. He added that he will even call a special session of the legislature to place a new severance tax on the ballot.

Involved in the dispute is nearly $5,000,000 in severance tax payments already collected or anticipated.

Money released . . . A short time before the governor issued his warning, Colorado's attorney general, Duke W. Dunbar, paved the way for the legislature to spend $1,827,061 in taxes paid under protest. The funds have been frozen since they were paid.

The attorney general ruled that taxes collected in 1953 and 1954 can be spent by the present legislature. The money has been frozen by the protests of several oil companies operating in Colorado.

Robert Sullivan, Denver counsel for The California Co., said the ruling "makes it more imperative than ever" that his company test the constitutionality of the tax in District Court. The company was recently rebuffed by the Colorado revenue department when it filed a claim for a refund of $955,238 paid under protest *(The Oil and Gas Journal, January 24, page 71)*.

Dunbar said the oil companies could still draw interest on the money if a court ordered it repaid. He said this would be true whether it was kept in a special fund or placed in the state general fund and spent.

The tax was passed in 1953 and is expected to yield $2,500,000 this fiscal year and the next. Colorado collected $89,000 more than that in the fiscal year which ended last July 1.

CANADA

Cardium Pay Sought

Union Oil plans wildcat 32 miles west of Pembina

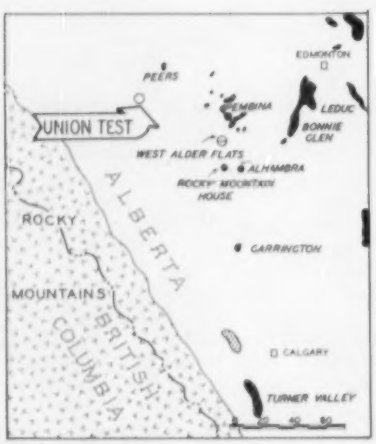
EDMONTON.—Union Oil Co. of California is going to try to extend Cardium sand oil production 32 miles west of any Pembina oil wells.

The company last week announced plans for its first wildcat on Crown Reservation 1733 in the Wolf Creek area of Alberta. Projected depth of the 6-36 Wolf Creek test is 7,500 ft. The Cardium sand is expected at about 3,300 ft. subsea.

The wildcat will be 14 miles south of Shell Oil Co.'s Wolf Creek failure, and 21 miles southwest of Shell's 2 Peers, indicated Cardium-sand discovery. Location is 32 miles west and 5 miles north of Stanolind-Hudson's Bay C-1 Pembina Crown discovery.

The Cardium sand dominates western Canadian exploratory thinking. Los Nietos Co. has an indicated strike from that sand at West Alder Flats, 12 miles south of the main section of Pembina field. Success was promised on the basis of two drill-stem tests from 5,679 to 5,718 ft.

Los Nietos is a wholly owned subsidiary of Union. It has 50 per cent interest in the West Alden Flats well and acreage. The remaining 50 per cent is split among Canadian Superior Oil Co. of California, Ltd. (25 per cent); Bailey Selburn (12½ per cent); Great Plains Development Co. of Canada, Ltd. (10 per cent); and Triad Oil Co., Ltd. (2½ per cent).



The Cardium produces or has been indicated in nine Alberta fields *(see map)*. Production is at Pembina, Peers, Alhambra, Rocky Mountain House, and Garrington. Production has been indicated at Leduc, Bonnie Glen, West Alder Flats, and Turner Valley. The distance between Peers at the north end of the trend and Turner Valley at the south is 210 miles.

Canadian Gas Pact Signed

CALGARY. — Trans - Canada Pipe Lines, Ltd., has signed its first natural-gas sales contract, under which it will supply an estimated $100,000,000 worth of gas to the Union Gas Co. of Canada, Ltd., over a 20-year period.

Union's system, now covering southwestern Ontario, will take approximately 300 billion cubic feet of natural gas from Trans-Canada. Delivery will start as soon as Trans-Canada's line reaches Toronto.

Construction on the 2,250-mile Alberta-Montreal pipeline is to start this spring. The line is scheduled to reach Toronto by November 1956.

Union is seeking approval of the U. S. Federal Power Commission to increase its imports of gas from the Panhandle line at Detroit so its present system can be expanded. This proposed expansion would be in the area of Hamilton, Ont., where there is a large industrial, commercial, and domestic market for gas.

Pipeline Directors Named

CALGARY.—A permanent board of directors for the Alberta Gas Trunk Line Co. has been named.

The board is made up of five gas producers and two representatives of the provincial government.

Gas producers are F. A. Brownie, Canadian Western Natural Gas Co.; N. E. Tanner, Trans-Canada Pipe Lines, Ltd.; Ralph Will, Hi-Tower Drilling, Ltd.; Vern Taylor, Imperial Oil, Ltd.; and Carl Jones, Hudson's Bay Oil & Gas Co., Ltd.

While the government representatives have not been named, R. J. Dinning and George Church are expected to fill the posts.

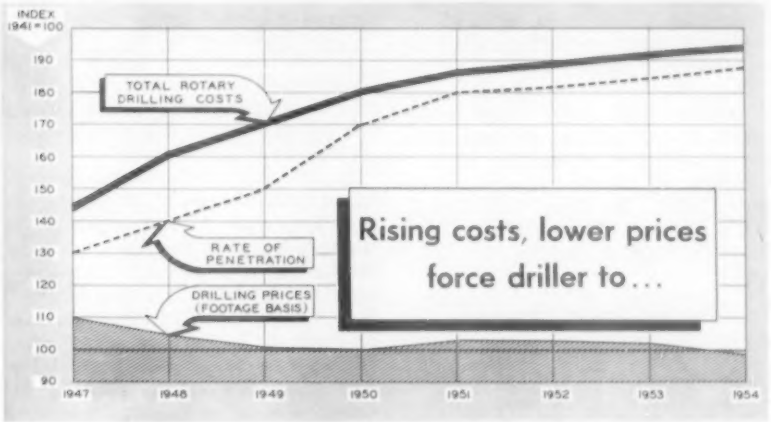
A construction permit for the line was issued in December.

Gulf Has Canadian Strike

CALGARY.—The Clear Hills district of northeastern Alberta has recorded what may be the best oil discovery in the province this year.

Canadian Gulf Oil Co.'s 4-15 Clear Hills, 45 miles northwest of the town of Peace River, is continuing production tests in the granite wash. Earlier reports showed that the well flowed 50 bbl. per hour on a small choke. About 40 ft. of effective pay zone was found at 6,893 ft. or 4,538 ft. subsea.

Canadian Gulf has staked location for a follow-up to 4-15. The well will be 14-10 Clear Hills, ⅜ mile southeast of the discovery well. The Clear Hills area is 67 miles east of the British Columbia border and about 11 miles northwest of the Dixonville area capped gas production.



Cut More Hole Per Day

DALLAS.—Drilling contractors over the United States drilled 4 per cent faster last year than in 1953, the American Association of Oilwell Drilling Contractors revealed here last week.

The A.A.O.D.C. pinned a percentage on the trend which had obviously been under way all year. Contractors are drilling more wells with fewer rigs.

The better rate of penetration is evidence of the contractor's efforts to keep from falling by the wayside due to tougher and tougher competition.

Though drilling rates have increased every year since 1941, the 4 per cent gain in 1954 was the highest recorded since 1951. The jump in drilling efficiency is even more significant when you consider that basic drilling equipment has changed little in the past several years. A pronounced increase in this rate now means much more than the same jump would have meant 2 or 3 years ago.

Efficiency counts . . . A.A.O.D.C.'s figures show that the contractor was caught in somewhat of a vicious circle last year. There were plenty of holes to dig (A.A.O.D.C. estimates a record 53,500 wells were drilled) but there were more than plenty of rigs to drill them. Only the more efficient got the contracts. Last year an average 2,657 rigs (120 less than in 1953) drilled an estimated 215,320,000 ft. of hole—up 17,400,000 ft. over 1953.

Due to the heavy competition, the average contract price per foot dropped 35 cents (6 per cent) to $5.25 last year. A.A.O.D.C. says, however, that the total average price per foot—including day work—stayed about the same at $12.50 per foot.

On the other side of the ledger, the contractor's costs went up another 2 per cent last year. His labor and equipment costs both increased this much, and his miscellaneous costs were about 3 per cent higher.

Deeper holes . . . Other A.A.O.D.C. figures show that contractors are drilling more wells and more footage and wells are going deeper.

Contractors last year drilled an estimated 49,220 of the 53,500 wells and 198,094,400 ft. of the 215,320,000 ft. of hole. In both cases this figures out to 92 per cent.

Average well depth was 4,025 ft.—9 ft. deeper than in 1953. The time required to drill the average well was cut 2 per cent.

The A.A.O.D.C.'s figures on completions, total footage, and average well depth are all estimates. The January 31 issue of The Oil and Gas Journal, page 140, lists actual totals for all three figures. The Journal's figures were higher in every case. Actual completions were 53,930; total footage was 218,986,000 ft.; and average well depth was 4,061 ft.

Barber Sale Completed

CASPER, Wyo.—Pure Oil Co. has completed its purchase of the W. H. Barber Co., Minneapolis, Minn.

The sale was recently approved at a Minneapolis meeting of Barber stockholders. No sale price has been disclosed.

Barber's holdings included 37 wells in the Dallas dome and Derby fields of Wyoming. They are producing an average of 350 bbl. of oil daily.

Shale Unit Planned

Union to study commercial aspects of Rifle holdings

LOS ANGELES.—Union Oil Co. of California will spend $5,000,000 this spring to build a plant to study the commercial possibilities of its shale-oil holdings near Rifle, Colo.

Reese H. Taylor, president of Union, said that its scientists now believe that shale oil as a source of liquid fuel may be competitive with domestic petroleum.

Taylor explained that Union would definitely enter full-scale commercial operation if the research and development project warrants it.

The plant will have a 1,000-ton daily pilot retort. This will yield from 800 to 900 bbl. of shale oil daily or approximately 92 per cent of the shale's oil content.

The retort will be patterned after a 50-ton experimental plant the company has been using at Wilmington, Calif. The 50,000-acre shale deposit held by Union at Rifle has an estimated reserve of 5,000,000,000 bbl. more than eight times Union's proved crude-oil reserves.

Waste Confab Set

Texas group will discuss pollution at March meeting

COLLEGE STATION, Tex.—Several technical papers on water and air pollution are scheduled during the industrial-section portion of the Texas Water and Sewage Works Association's thirty-seventh short course here March 7-9.

The course, actually more of a technical meeting, will be held in cooperation with the Texas Department of Health at the Memorial Student Center on the Texas A. & M. College campus.

A panel discussion of "Industrial Waste Analyses Proposed in the New Standard Methods" is scheduled March 9. Panelists will be L. L. Hedgepeth, American Cyanamid Co., Bound Brook, N. J.; Roy F. Weston, Atlantic Refining Co., Philadelphia; Don E. Bloodgood, professor of sanitary engineering at Purdue University, Lafayette, Ind.; and W. S. Mahlie, city chemist for Fort Worth.

Report of the chairman of the industrial waste section, K. E. Mills, Pan American Refining Co., Texas City, Tex., is set for the March 7 session.

Other oil men who will preside over sessions or lead discussions during the meeting are: W. W. Wallentine, The

Texas Co., Port Arthur, Tex.; B. E. Norwood, Shell Oil Co., Houston; Ovid Baker, Magnolia Petroleum Co., Dallas; and J. W. Eberman, Shell Chemical Corp., Houston.

T.G.T. Switches Plans

Firm seeks permit to build Agua Dulce-Kinder pipeline

HOUSTON.—Tennessee Gas Transmission Co. has asked the Federal Power Commission for permission to build a 370-mile, 30-inch natural gas line from Agua Dulce, South Texas, to Kinder, La.

The $35,400,000 pipeline would begin at the company's mainline compressor station at Agua Dulce and skirt the Gulf Coast to Kinder. T.G.T. points out the line would pass through an important part of the Gulf Coast supply area where the company has no lines. Its proximity to the coast would make it possible to pick up gas from offshore wells, once production in that area makes gas available.

The new line, which will have a 270,000 M.c.f. daily capacity, is a substitute for pipeline and compressor facilities already authorized by FPC. These included looping and station expansion along the main system between Agua Dulce and Natchitoches, La.

The new pipeline would provide T.G.T. with a continuous, 946-mile, 30-inch line running from South Texas to Portland, Tenn., separate and apart from its main system. In 1954, T.G.T. built a 576-mile pipeline from Kinder northeast across Louisiana, Mississippi and Tennessee. This joins the main system at the Portland station north of Nashville.

Badger Begins Operations

CHICAGO.—Badger Pipe Line Co. is delivering products through its line from Rockford, Ill., to Madison, Wis.

The recently completed line consists of 182 miles of 12-in. mainline and 18 miles of 10-in. from Lemont, Ill., to near Chicago.

Badger also bought a Sinclair Pipe Line Co. 8-in. line from Peru, Ill., to Rockford. This line will be used to take deliveries from a terminal on the Illinois Waterways and from Great Lakes Pipe Line Co. Great Lakes crosses Badger halfway between Peru and Rockford at Middlebury, Ill.

Badger is owned by Cities Service Oil Co., The Texas Co., Sinclair Pipe Line Co., and Pure Oil Co. Cities Service will act as operator.

Florida Refinery Planned

WASHINGTON. — M. H. (Bud) Robineau, president of Frontier Refining Co., Denver, heads a group of stockholders which has announced plans for a 15,000-bbl. refinery at West Palm Beach, Fla.

Robineau, whose Frontier company operates a 10,000-bbl. refinery at Cheyenne, Wyo., said that the Office of Defense Mobilization issued a certificate for a fast tax writeoff.

The refinery will be built and operated by Miami Oil & Refining Co., of Denver, at an estimted cost of $12,000,000. The amortization certificate covered 65 per cent on $6,442,000 and 40 per cent on $5,043,000.

Bay Completes Expansion

SAGINAW, Mich.—Bay Refining Corp. has finished an expansion program at its 10,500-bbl. refinery at Bay City, Mich.

Southwestern Engineering Co., Los Angeles, did the engineering and construction on a 6,000-bbl. Thermofor catalytic cracking unit and a 600-bbl. polymerization unit.

Hughes Tool Wins Case

WASHINGTON.—Hughes Tool Co. does not violate the antitrust law when it leases drilling equipment, the U. S. Supreme Court said last week.

Three defendants in a patent infringement suit asked the court to review a Tenth Circuit Court decision and the high court turned down the request. The three contended the lower court erred by refusing to listen to evidence that Hughes has a monopoly in the drilling bit field.

Hughes does not sell its patented rotary bits. It leases them to oil and gas drillers and requires they be returned when worn out. Those who use the bits must agree not to turn them over to others. This prevents independent "retippers" from repairing Hughes bits or selling them.

Imports, Exports Up

Venezuelan crude receipts are highest since March

TULSA.—Both imports and exports increased in November. Compared with November 1953, imports gained 6.8 per cent, but total exports dropped slightly.

Crude from Venezuela was the highest since last March. Movement of Canadian crude to new refineries in Washington raised the November total for Canada to 18,600 bbl. daily compared with 2,400 bbl. in October. West Coast imports of Far East crude dropped to 15,800 bbl. daily from 48,700 bbl. the previous month. Import-export data are compiled by the Census Bureau of the Department of Commerce.

In its published report, the bureau revised the October total from Saudi Arabia. Since the new figure gives an abnormal value for this crude, the original total has been retained in the accompanying table.

All of the heavy crude reported for Kuwait and Saudi Arabia has been deducted from the totals for these countries and credited to the Neutral Zone.

IMPORTS INTO CONTINENTAL U. S.
(Thousands or barrels)

	Nov. 1954	Oct. 1954	Nov. 1953
Crude—			
Mexico	381	480	180
Colombia	819	704	1,066
Venezuela	11,370	9,439	9,027
Peru	110	126	
Trinidad	102		
Kuwait	3,643	2,981	3,213
Saudi Arabia	2,328	2,117	2,445
Neutral Zone	217	622	
Iraq			103
Qatar	217	399	527
Canada	559	73	183
Far East	475	1,510	1,175
Total crude	20,221	18,451	17,919
Daily average	674	595	597
Products—			
Residual fuel	12,241	11,161	12,997
Other products	1,524	1,937	881
Total products	13,765	13,098	13,878
Daily average	459	423	463
Total all oils	33,986	31,549	31,797
Daily average	1,133	1,018	1,060

EXPORTS*

	Nov. 1954	Oct. 1954	Nov. 1953
Crude	1,047	1,485	1,052
Gasoline	2,175	2,529	2,604
Kerosine	427	187	489
Distillate	2,682	2,156	2,150
Residual	1,832	1,297	1,912
Lube oils	1,043	1,188	1,183
Other products	773	1,015	625
Total all oils	9,979	9,857	10,015
Daily average	333	318	334

*Excludes shipments to territories.

FPC Briefs Congress

Kuykendall will talk about gas regulation after cabinet committee reports; senator wants Natural Gas Act review

WASHINGTON.—The Federal Power Commission is ready to talk to Congress about regulation of natural-gas producers, but it will wait until after the cabinet committee on resources reports to President Eisenhower.

FPC Chairman Jerome K. Kuykendall appeared last week before the House commerce committee in one of his regular "briefing" sessions for new members of Congress. He avoided talking about the natural-gas regulation problem except in general terms.

Sen. Warren Magnuson of Washington, however, is asking for $200,000 for investigations, chiefly into the Natural Gas Act and producer regulation. Magnuson heads the Senate commerce committee.

The FPC chairman told congressmen his agency has reshuffled its offices. It has set up a new bureau of rates and gas certificates. All commission lawyers have been grouped in the office of the general counsel, headed by Willard W. Gatchell. The natural-gas division and a number of other branches once in the bureau of law have been cut out.

Kuykendall said the Phillips decision of the Supreme Court leaves his commission "no choice" in applying the Natural Gas Act to producers. He said the rules for independent producers are more practical and less burdensome than others that could have been applied. He added that the FPC needs at least 80 more employes to handle applications from producers.

These changes needed . . . Specific ideas for changes in the Natural Gas Act were handed the committee by Kuykendall. Some give the FPC more powers. They include:

. . . **Authority** for the commission to regulate security issues of pipeline companies.

. . . **Authority** to require companies to connect lines and sell or exchange gas on prescribed terms and conditions.

. . . **Broad investigatory power** over the gas industry like the commission now has over electric power.

. . . **Control of companies** importing or exporting gas so far as United States operations are concerned.

. . . **Control over allocation** of natural gas when required for national defense or in an emergency.

. . . **Approval by the commission** for transfer by pipeline companies of reserves which are part of the base on which certificates are issued.

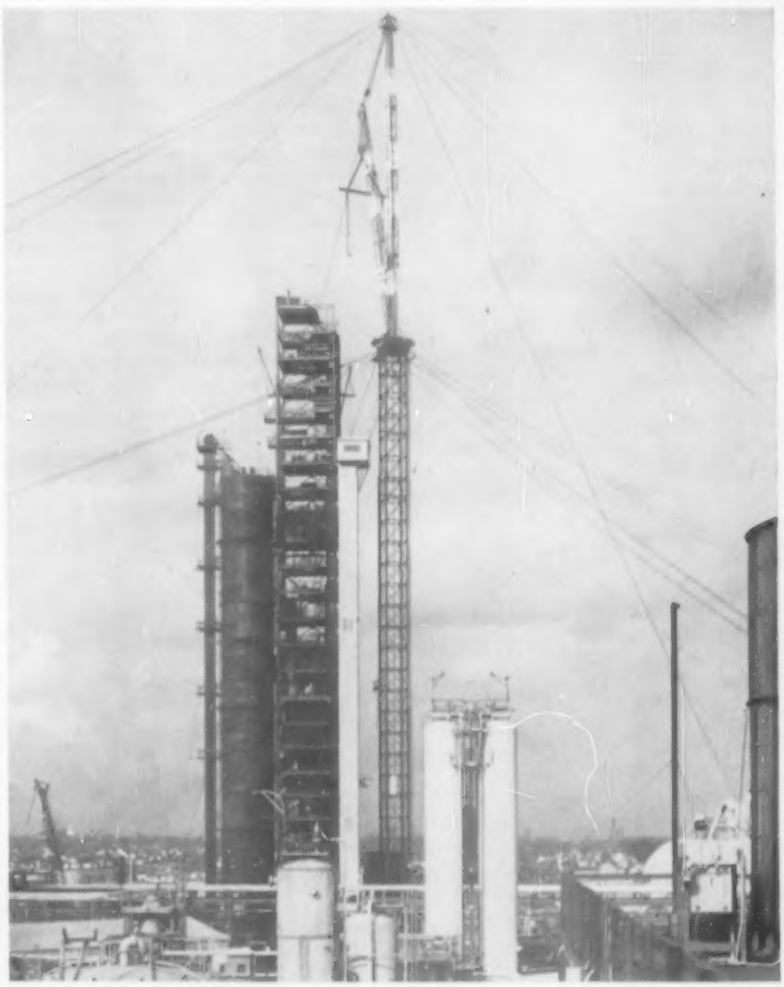
Other changes recommended by Kuykendall would allow voluntary connection of pipelines, under FPC certificate, for emergency use, and setting up safety regulations for construction and operation of interstate pipelines.

Request for funds . . . Magnuson asked the Senate rules committee for money to investigate regulation. He pointed out there has been no complete review of the Natural Gas Act since it was passed 17 years ago.

He said its time to look over the requests for changes in the act the FPC has made in the past.

Magnuson told the committee the Phillips decision "touched off a major explosion" in the natural-gas industry. He pointed to charges that the FPC is in a state of "chaos and confusion," and the warnings the FPC will bog down if it tries to examine every producer's contract.

"Within the last few days, the oil



Special Crane for Refining Jobs

A special crane that juts more than 300 ft. high is being used by Sun Oil Co. in the construction of two catalytic reforming units. The Houdriforming units are going up at Sun's Marcus Hook, Pa., and Toledo, Ohio, refineries. The Marcus Hook unit will have a capacity of 15,540 bbl. daily. The Toledo unit's capacity will be 18,000 bbl. daily. Chicago Bridge & Iron Co. constructed the crane and its substructure.

and gas industry has announced it will launch a gigantic publicity and educational program to gain consumer support for legislation to free gas producers from federal controls . . ."

His committee, Magnuson said, will try to avoid a full-scale investigation. It intends to make an exploratory review only. But, he added, he will ask for money for a thorough probe if one is needed.

Tanker Fleet Lags

Number of private vessels continues downward trend

WASHINGTON.—The United States private-tanker fleet is taking a beating from economic and military developments, the American Merchant Marine Institute reported last week.

Today's tanker fleet of 405 vessels of 6,634,568 deadweight tons is 38 vessels and 320,000 tons below a year ago. It is at the lowest level in the past 6 years, although it is still 2,400,000 tons greater than in 1939. Construction of 15 tankers last year failed to offset the withdrawal of 53 vessels, 45 of which were transferred or sold abroad.

Big factors in whittling down our oil fleet were the increased efforts of foreign-flag ship operators to get more of the foreign trade and the declining military movement which cut the use of tankers by the Military Sea Transportation Service.

One factor which helped offset the drain, according to the institute, was the Maritime Administration's decision to relax its policy on the transfer of uneconomical tonnage to foreign registry. Also offsetting the trend toward a smaller fleet, the industry pointed out, were the enactment of legislation requiring that at least 50 per cent of all Government-financed cargoes move in privately owned U. S. flag vessels and the law permitting owners to trade in older vessels to the Maritime Administration to help pay for new construction.

The institute called for quick development of means of keeping our tanker fleet up to par.

"Although our current tanker fleet as a whole is relatively younger than the fleets of our foreign competitors, we face the unique problem of having soon to replace over 85 per cent of the tank vessels now under U. S. flag," it pointed out.

Venezuela Pledges Support

WASHINGTON. — Venezuelan oil will be available to the United States in case of a crisis in Formosa.

Venezuelan Ambassador Gonzales last week pledged his government's full support and resources to meet Communist aggression in the Far East.

Dr. Aureliano Otanez, foreign affairs minister, gave "the assurance that Venezuela's natural and strategic resources, especially petroleum and iron ore, will be placed at the service of the cause which has led President Eisenhower to request the American Congress for special powers to safeguard principles of liberty and justice."

The statement was released as the coal industry launched a bitter attack on imports of residual-fuel oil from Venezuela.

WATCHING WASHINGTON

Bertram F. Linz

Training Method Eyed

Industry training of government people in methods, techniques and machines is under consideration in administration circles.

The idea was disclosed by President Eisenhower in one of his messages to Congress. He commented on the fact that few government agencies have complete training programs although they deal with industrial problems whose solution may depend upon the latest knowledge.

Industrialists complain that government agencies do not keep their knowledge up to date and sometimes based decisions on practices and conditions that prevailed a decade ago.

To correct this situation, Congress may be asked to approve a comprehensive t r a i n i n g program under which the government agencies would send employes to private laboratories, industrial plants, universities, or state agencies.

The training of thousands of workers would be expensive, officials admit. But they contend it would pay off in efficiency in governmental operations, particularly in those involving industrial questions. They say it would reduce criticism of "bureaucracy" and lead to better relations between the Government and business.

New Try for Controls

A new effort will be made to set up standby price, wage and possibly materials controls for the oil and other industries.

The idea will be proposed when Congress gets around to extension of the Defense Production Act. President Eisenhower, who opposed it last year, is reported to have dropped his objections. But he still believes peacetime provision for wartime controls is not desirable.

The standby legislation would become effective at the declaration of an emergency. The idea is to avoid the delays and controversies which marked the development of controls in World War II and the Korean emergency.

There is no particular opposition in Congress to planning the wartime control of the economy in advance. But a major point of controversy has been over whether the emergency which triggers its application is to be declared by the President or Congress. In the past there has been considerable suspicion at the Capitol that a President might dream up an emergency if he felt it was politically or otherwise expedient.

The Nuclear Power Story

The Atomic Energy Commission has come up with a novel analysis of the world's fuel supplies to support its drive for a quick start on industrial development of nuclear power.

The basic theory is that we are living in an age of diminishing resources. The question is how fast are they diminishing. That is where the novel analysis comes in.

According to a study made for the AEC, the world burn-up of energy was between 6 and 9 energy units during the first 1,860 years of the Christian era (one energy unit equals a billion billion B.t.u.'s). But between 1860 and 1947, the consumption was 4 energy units. In the single year 1950 it was 0.2 of a unit.

Consumption naturally will continue to increase. By the year 2000, only 45 years away, the world may be consuming fossil fuels at a rate of 1 energy unit a year.

The AEC study estimates fuel reserves in the world at about 27.2 units. Coal accounts for 21, oil and gas for 5, and oil shales and tar sands for 1.2.

We have a pretty small fuel bin, the study says, with possibilities oil and gas supplies will fall short of needs within relatively few years. Then more fuel will be badly needed and uranium is the answer.

Import Peril Cited

Domestic producers, coal industry tell House committee nation will suffer unless foreign oil flood is curbed

WASHINGTON. — Unrestricted oil imports are casting the shadow of disaster over one of the nation's largest and most vital industries, a congressional committee was told last week.

More than a dozen domestic oil producers told the House ways and means committee that a 3-year extension of the Reciprocal Trade Agreements Act will endanger the national security unless provision is made to limit oil imports.

The group challenged earlier statements by four importing companies that imports are not high enough to hurt domestic production *(The Oil and Gas Journal, January 31, page 121)*. Production cutbacks by state commissions show that imports are hurting, they said.

The coal industry is asking a quota on imports of residual fuel oil. To get it they joined domestic producers in a demand for a 10 per cent quota on oil imports.

A 10 per cent quota, the producers said, will assure an expanding domestic industry capable of providing future oil supplies.

The oil industry is not thinking only of itself, witnesses said. The same consideration should be given to others essential to the national security by limiting imports if they threaten necessary domestic supplies.

About 25 per cent of domestic producing capacity is shut-in because it cannot compete with imported oil, producers said. But more than 80 per cent of the free world's oil reserves outside the United States is in easy reach of the Russians.

Producers pointed out that the foreign reserves are controlled by a few companies. Coal industry witnesses went further. They charged that the imports of residual are part of the program of an international oil cartel. Only the cartel, and not the foreign producing countries, benefits from the dumping of this oil, they said.

The committee is headed by Rep. Jere Cooper of Tennessee who is expected to support President Eisenhower's request for extension of the reciprocal trade program without change. But the domestic industry offered strong arguments why oil imports should be held to a reasonable level.

Domestic producers talk . . . Unless action is taken, large and increasing surpluses of foreign oil will seek outlets here, W. M. Vaughey, president of the Independent Petroleum Association of America, warned.

Middle East oil is within reach of the Communists and we should be cautious about becoming dependent on oil supplies which could be cut off quickly, Russell B. Brown, general counsel of the association, said.

The present policy on imports has made it necessary for Oklahoma to cut the unallocated oil allowables from 75 to 15 bbl. daily in the past year, Roy G. Woods, Oklahoma City, president of the Oklahoma Independent Petroleum Association, said. Unemployment of oil-field workers increased 156 per cent last year in the state and as much as 400 per cent in some Oklahoma counties.

Expanding imports have absorbed all the growth in domestic oil markets since 1953, J. P. Coleman, Wichita Falls, Tex., president of the National Stripper Well Association, declared. As a result, the market for domestic oil this year will be not greater than it was 2 years ago. The squeeze is going to have a domestic effect on future supplies.

If the trade program is not changed vital domestic industries will be sacrificed to provide a slightly greater dollar purchasing power abroad, R. L. Foree, Dallas, representing the Texas Independent Producers and Royalty Owners Association, charged.

A readily available domestic oil supply is the only assurance of real national defense, the committee was told by Jack Woodward, Dallas, president of the association.

Coal speaks . . . The most bitter attack on oil imports came from Joseph E. Moody, president of the Southern Coal Producers Association.

The importing companies, Moody said, talk about the necessity of keeping an open door in Venezuela for sale there of our products. But while Venezuela objects to any quota on her oil exports, she bans the import of shoes almost entirely, keeps tires out by quotas and duties, and imposes high tariffs on textiles and other commodities.

Moody said there is strong sentiment for imports on the East Coast. The seaboard states apparently think they get real benefit from the dumping of residual.

Actually, he argued, "since the international oil cartel is operated for profit, there seems little doubt that any gain which New England gets from cheap fuel oil is more than offset by higher prices for lighter oil products."

Top Sohio Officials Inspect Lab

Standard Oil Co. (Ohio) dedicated the research-engine laboratory addition of its Chemical and Physical Research Laboratory in Cleveland recently. On hand were Sohio's top-management research committee. Inspecting an engine are, left to right, Clyde T. Foster, Sohio president and research committee chairman; Dr. Everett C. Hughes, research manager; Elliott B. McConnell, vice president in charge of manufacturing; and Samuel H. Elliott, vice president in charge of sales.

May Is Rubber Target

WASHINGTON.—The Government should be out of the rubber business by May.

Barring a congressional "no," sales of the government's synthetic-rubber plants will be wound up in April. Starting with May, buyers who purchase on a 30-day basis will have to place orders with the new owners. Long-term contracts will all be shifted by the end of July.

Under the sales program worked out by the rubber disposal commission, the plants will be turned over to the buyers on a full production basis. The buyers have agreed to take all inventories of finished rubber left in government hands, so there will be enough stock to permit a steady flow from plants to consumers.

The research, which the Government is required to carry on under the disposal bill, will be transferred to the National Science Foundation.

The work to be transferred is on two levels. A basic research program is conducted by contract with 9 educational institutions and three research organizations. A government-owned laboratory at Akron, Ohio, is operated under contract with Akron University.

The government's synthetic rubber production has been handled by the Federal Facilities Corp. The sale of all but three of the 27 plants was worked out by a special commission, whose recommendations are now being studied in Congress.

Shell Dedicates Building in New Orleans

NEW ORLEANS. — Shell Oil Co. dedicated its new 14-story, $7,000,000 office building here last week.

The new building will serve as exploration and production headquarters for the New Orleans area, headed by Bouwe Dykstra, vice president. Other Shell area headquarters in North America are in Tulsa, Houston, Midland, Denver, Los Angeles, and Calgary.

Shell has enlarged its exploration and production activities in the Deep South and recently established headquarters in New Orleans for a five-state marketing division. The company will occupy about 63,000 of the 350,000 sq. ft. of space in the new building, which is located on grounds leased for 99 years from Tulane University.

The Roosevelt Hotel has 200 new rooms on the upper seven floors. On the third floor is the $500,000 International Room, the hotel's spacious banquet hall. Also on the third floor are the quarters of the New Orleans Petroleum Club.

New Orleans Mayor deLesseps S. Morrison cut the ribbon officially opening the building. Heading the Shell officials attending were H. S. M. Burns, president, and Dykstra. Other officials included Louisiana's Gov. Robert F. Kennon, and J. M. Jones and Dr. Rufus Harris, of Tulane University.

High Court Gets Lease Law

WASHINGTON.—The Supreme Court has been asked to rule whether Montana's 1953 leasing law is legal.

The Montana Supreme Court held that the law, which would permit leases for an indefinite period, was contrary to the act under which the state was admitted to the Union. As a result, leases would be limited to 20 years.

The case was brought to Washington by Ford Johnson, Helena, Mont., one of the plaintiffs in the suit. Johnson said in his appeal that amendments to the enabling act permit not only Montana, but also North and South Dakota and Washington, to grant oil and gas leases on certain state lands for as long as production can be had.

California Gas Conscious

WASHINGTON. — California consumers got a preview last month of what federal regulation of natural-gas producers could mean.

In just a few days of unusually cold weather, storage wells had to be tapped at Goleta. Southern California Gas Co. withdrew about 100,000 M.c.f. daily from storage, but still had to cut off industrial consumers.

That, Rep. Harry R. Sheppard told the House last week, is why the people of southern California are genuinely concerned over Federal Power Commission regulation of gas producers. They are dependent on other states for just about half of their natural gas supply.

Leases to Be Offered

WASHINGTON. — The Bureau of Land Management will sell oil and gas leases on government lands in Colorado and Wyoming this month.

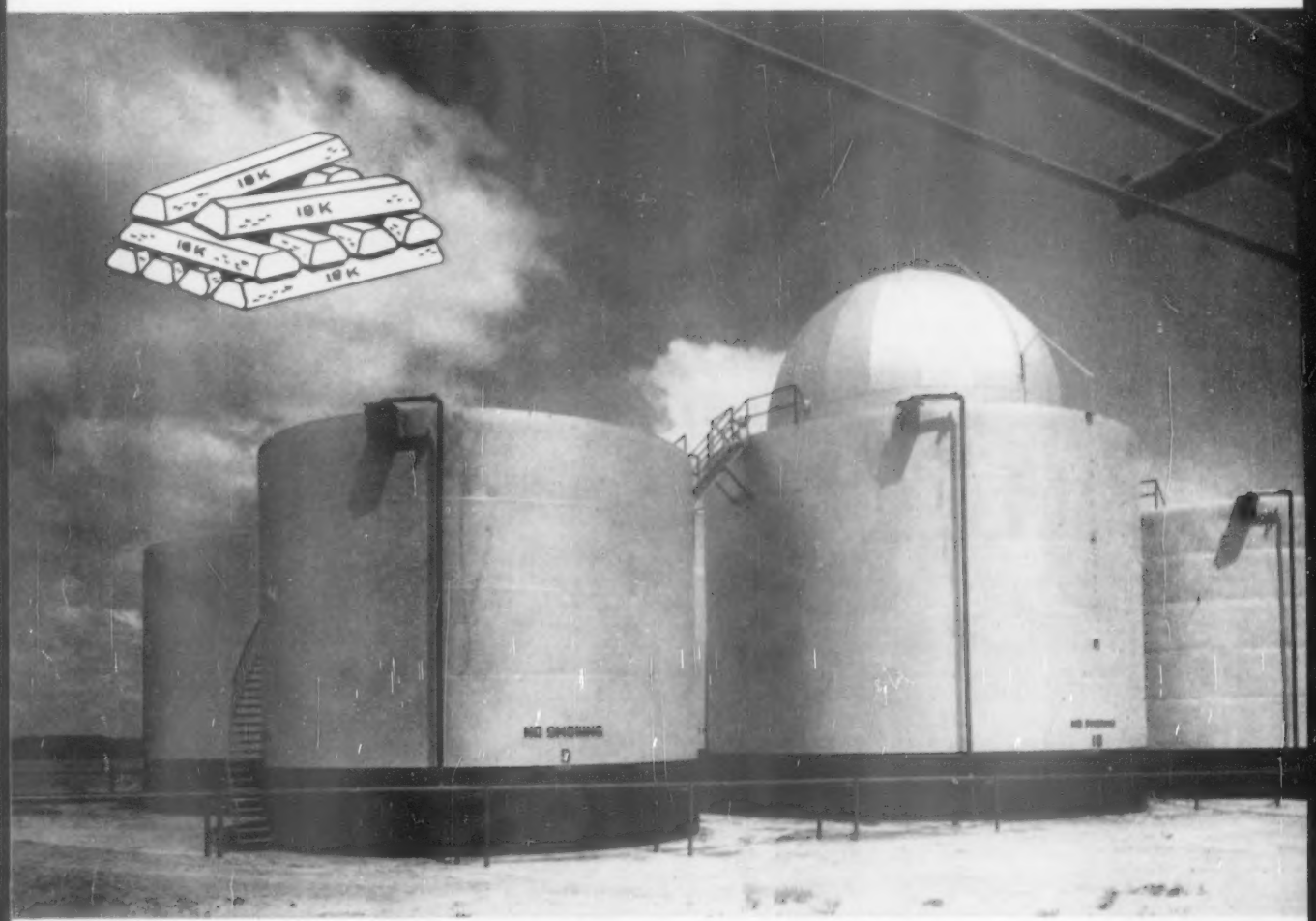
Bids will be opened February 16 for three leases comprising 480 acres of public lands on the structure of the Bell Rock field in Moffat County, Colorado, 8 miles west of Craig. Two of the leases will cover 200 acres each and the other 80 acres.

Tanker Deals Set March 1

WASHINGTON.—Contracts for the long-term charter of supertankers to be built for the Military Sea Transportation Service are scheduled to be awarded March 1.

The Navy, planning to build four tankers and lease 15 others under legislation passed by Congress last year, received offers from private companies to build 23 vessels and operate them for the Government under 10-year charters.

IF GOLD VAPORIZED...



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BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

Platform Joins Fleet

Offshore Co. commissions mobile unit designed to drill 15,000-ft. depths in gulf waters as deep as 100 ft.

ORANGE, Tex.—Latest addition to the tidelands drilling fleet was commissioned here last week by Offshore Co., which headquarters at Baton Rouge.

The new mobile drilling platform, capable of drilling in 100 ft. of water and to depths below 15,000 ft., was formally accepted by C. T. Chenery, Offshore board chairman.

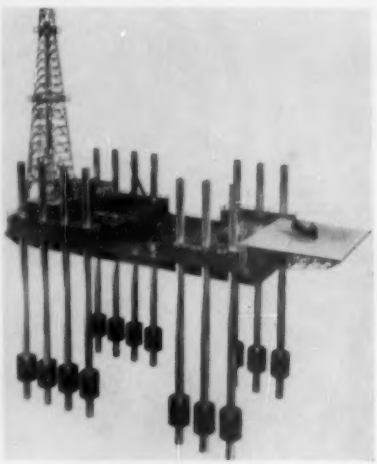
After a demonstration of its portable features, preparations were made to move the platform to its first location near Grand Isle, La., where it will drill under contract to Humble Oil & Refining Co.

DeLong type . . . The new platform's design is based on patent applications of Col. L. B. DeLong. The unit is a refinement of an earlier model which was capable of operating in water no more than 50 ft. deep. The hull is 220 ft. long, 117 ft. wide, and 13½ ft. deep. With drilling equipment, it weighs more than 4,200 tons.

The platform is supported by 14 caissons 200 ft. long and 6 ft. in diameter; each weighs 94 tons. Cylindrical tanks weighing 43 tons apiece circle the lower ends of the caissons. They are 18 ft. high and 16 ft. in diameter. These tanks, or "doughnuts," serve as a buffer against excess penetration into the mud. The caissons and tanks bring the over-all weight of the unit to more than 6,100 tons.

Prime engineering feature is a series of large air jacks, one working on each caisson. The jacks operate simultaneously or individually from a central control panel. The caissons will rise above wells set along the sides of the hull, while the unit with complete equipment is towed as an ordinary barge to location.

Jacks . . . Once on location, the caissons will be dropped to the sea floor. The jacks, which are secured to the deck, are operated in unison and in effect climb the caissons. The platform naturally rises with them and the jacks are operated until the desired height is reached. Mechanical grippers built into the jacks grasp the caissons and clamp the hull firmly in place. The jack may be operated individually to level the platform as needed.



To move from one location to another, the jacking operation must be reversed. When the caissons are withdrawn the platform will be ready for towing to its next location. On the basis of tests the new model can be erected in 100 ft. of water and readied for drilling in less than 24 hours after reaching location. It can be lowered and on its way to a new location in the same length of time.

The platform has crew quarters, kitchen, galley and recreation room, all air-conditioned, to accommodate 46 men. A large helicopter landing space is located on the forward deck. All of the drilling and auxiliary equipment is above deck and set generally on the rear half of the platform.

Primary drilling equipment is at the extreme rear and will operate through an opening cut inward from the rear edge of the hull. This open-faced slot allows the platform to be pulled away from the well when it is completed.

Crew quarters are below deck, and the hull also serves for storage. It has a capacity for 17,000 gal. of drinking water, 107,000 gal. of salt water, 320,000 gal. of drilling water, and 52,000 gal. of fuel oil.

Offshore is a subsidiary of Southern Production Co., Inc., Fort Worth. The new platform was constructed by Consolidated Western Steel Division of United States Steel Corp.

Offshore has another deep-water portable drilling barge operating for Humble off the coast of Louisiana. Another such vessel is being built for the company *(The Oil and Gas Journal, January 10, page 49)*.

Offshore Strike

Gulf tests 140 bbl. daily of 47° oil in rank wildcat

PORT ARANSAS, Tex. — Gulf Oil Corp. has made a deep discovery in an offshore wildcat east of Mustang Island, 9½ miles southeast of here.

The well tested 140 bbl. of 47°-gravity oil daily through 10/64-in. choke. Production was from perforations at or near the gas-oil contact in the interval 11,452-60 ft. Gas-oil ratio was 10,000:1 and tubing pressure 3,100 psi.

Testing was in the lowermost of three productive zones ranging from 21 to 154 ft. thick.

The well, drilled in 48 ft. of water, is on Texas State Lease 41338 in Block 889 off Nueces County. It is a little more than 4 miles from nearest production on Mustang Island.

Gulf said the well will be shut in after further testing and the rig moved off location. It will be recompleted later when development plans have been worked out.

Gulf has applied for permits for two more wildcats in the area, one 19 miles northeast of the new strike and one 25 miles northeast of the discovery. The wildcats will be drilled in Blocks 742 and 717.

Offshore Well Fire is Out

NEW ORLEANS.—An oil well fire on a mobile drilling barge in Main Pass Block 69 field off Plaquemines Parish was out last week after burning out of control for 3 days.

The California Co. 4 State Lease 1277 blew out as it was drilling near 5,500 ft. Southern Production Co. was the drilling contractor.

The fire was extinguished when blank rams on the lower blowout preventer were closed.

Pan Am Opens New Lab

TEXAS CITY, Tex.—Pan American Refining Corp. has opened its new research laboratory here.

The new unit is one of six buildings in Pan American's research center. Research will be conducted here for the company's 35,000-bbl. refinery to be built at Yorktown, Va. The center also will serve the parent American Oil Co.

Iran's Return Felt

Free-world production record set at 12,414,000 bbl. daily during November; Iranian share topped 100,000 bbl. daily

Dahl M. Duff

FOR the first time in more than 3 years, Iranian crude-oil has again become important in Middle East and free-world output.

November—the first full month of operation of the eight-company Iranian oil consortium—showed a jump in Iran's output by more than 100,000 bbl. daily. At the same time, the other three leading Middle East producing countries were down nearly 175,000 bbl. daily.

The sharply increased output in Iran, coupled with record-high production in Venezuela, lifted free-world production for the month to a record 12,414,000 bbl. daily, up about 131,000 bbl. daily, or 1.1 per cent, over October.

Because of declines in Kuwait, Saudi Arabia, and Iraq, the net gain in foreign production was relatively small. The non-Communist foreign gain was up 36,300 bbl. daily. The gain from September to October was 268,500 bbl. daily.

U. S. production in November increased for the first time since the preceding August. Domestic output jumped nearly 95,000 bbl. daily to an estimated 6,230,000 bbl. daily.

Increase in 1954 . . . For the first 11 months of 1954, free-world production averaged 12,197,000 bbl. daily. This represented an increase of 368,000 bbl. daily, or 3.1 per cent over the corresponding period of 1953. The 11-month average of non-Communist foreign production was 5,867,000 bbl. daily, up 405,400 bbl. daily, or 7.4 per cent.

Continued sharp gains in foreign output, coupled with declines in the United States during most of 1954, brought foreign production to nearly equal the United States average. At 6,230,000 bbl. daily, U. S. production was only 46,000 bbl. daily above the non-Communist foreign average. In both October and November, foreign production was above 6,000,000 bbl. daily for the first time in the industry's history.

Neither Iranian Oil Participants, Ltd., the consortium holding company, nor National Iranian Oil Co. has announced production figures. But reliable reports say the November output averaged about 145,000 bbl. daily. Net production has been averaging 20,000 to 30,000 bbl. daily since 1951 when the Iranian Government nationalized the holdings of Anglo-Iranian Oil Co., Ltd. (now British Petroleum Co., Ltd.) and expelled the British staff. Anglo-Iranian's previous peak production was about 700,000 bbl. daily, highest in the Middle East at that time.

Kuwait, Saudi Arabia, Iraq . . . In November, output of the three other major Middle East oil countries—Kuwait, Saudi Arabia, and Iraq—fell back. Although the resumption of large-scale operations in Iran inevitably will be reflected in production elsewhere in the Middle East, a higher-than-anticipated output in these other countries is likely for the next few months on account of extremely strong demand for heavy-fuel oil in the Eastern Hemisphere.

Saudi Arabian production dropped 78,500 bbl. daily in November, Kuwait 42,200 bbl. daily, and Iraq, 53,500 bbl. daily. Despite its decrease, Kuwait continued above a million barrels daily. For the first 11 months of the year, Kuwait averaged 946,500 bbl. daily, and Saudi Arabia, 950,000 bbl. daily.

TREND OVER THE LAST YEAR

	Western Hemisphere less U.S.	Middle East	Total non-Communist foreign
1953—			
December	2,711.9	2,540.2	5,714.1
1954—			
January	2,682.8	2,491.2	5,636.4
February	2,703.7	2,550.6	5,695.3
March	2,642.9	2,767.6	5,872.7
April	2,565.1	2,642.0	5,653.1
May	2,639.3	2,766.0	5,863.8
June	2,648.5	2,685.0	5,805.5
July	2,667.0	2,758.7	5,890.9
August	2,663.7	2,749.5	5,891.9
September	2,704.5	2,702.2	5,879.2
October	2,751.5	2,903.6	6,147.7
November	2,846.2	2,844.6	6,184.0

CRUDE-OIL PRODUCTION

(Daily average in thousands of barrels)

Country—	Nov. 1954	Oct. 1954	Nov. 1953
W. Hemisphere:			
Argentina	80.0	80.0	82.8
Bolivia	6.0	5.5	2.6
Brazil	4.3	3.6	2.0
Canada	273.0	281.3	253.2
Chile	5.2	5.0	4.6
Columbia	104.4	107.8	108.2
Cuba	0.4	0.4	0.1
Ecuador	8.8	8.7	8.5
Mexico	237.0	237.0	190.7
Peru	46.5	47.2	45.5
Trinidad	65.2	65.3	62.5
Venezuela	2,015.4	1,912.0	1,871.1
Total	2,846.2	2,753.8	2,631.8
W. Europe and Africa:			
Algeria	1.3	1.2	1.8
France	15.0	13.6	7.3
Fr. Morocco	2.2	2.3	2.2
W. Germany	55.4	56.5	45.0
Italy	1.4	1.4	1.8
Netherlands	18.9	18.3	17.1
Egypt	37.1	37.4	45.0
United Kingdom	1.2	1.2	1.1
Total	132.5	131.9	121.3
Middle East:			
Bahrain	30.2	30.1	30.1
Iran	145.0	35.0	23.1
Iraq	614.8	668.3	580.2
Kuwait	1,029.4	1,071.6	826.8
Neutral Zone	30.0	20.9	
Qatar	110.3	106.3	69.1
Saudi Arabia	883.0	961.5	811.8
Turkey	1.9	1.8	0.6
Total	2,844.6	2,903.6	2,341.7

Country—	Nov. 1954	Oct. 1954	Nov. 1953
Other Asia:			
British Borneo	100.0	100.0	101.8
Burma	3.7	3.7	3.4
India	7.0	7.0	6.8
Indonesia	225.0	223.0	196.3
Japan	6.0	5.7	6.0
New Guinea	13.5	13.5	4.7
Pakistan	5.5	5.5	4.6
Total	360.7	358.4	323.6
Total non-Communist foreign	6,184.0	6,147.7	5,418.4
United States	6,230.0	6,135.4	6,277.2
Total	12,414.0	12,283.1	11,695.6
Communist-controlled countries:			
Russian zone of Austria	57.5	57.5	62.0
Romania	125.0	125.0	110.0
Russia	1,185.0	1,185.0	1,060.0
Others	36.8	36.8	34.7
Total	1,404.3	1,404.3	1,266.7
World total	13,818.3	13,687.4	12,962.3

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where completely current reports are lacking. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

Of Iraq's two major producing areas, Kirkuk was down 28,900 bbl. daily in November to 487,800 bbl. daily, and Zubair down 25,100 bbl. daily to 89,000 bbl. daily.

Venezuelan record . . . In the Western Hemisphere, Venezuelan production in November soared above 2,000,000 bbl. daily for the first time. The month's average was 2,015,400 bbl. daily, bringing the 11-month average to 1,877,900 bbl. daily. Seasonal demand for the heavy crudes which make up about 60 per cent of Venezuela's output was a major factor in the increase.

Peruvian Test Hits

Sechura Desert discovery is made by local company

A COMPANY owned by Peruvians has brought in the first oil discovery on acreage acquired under the country's 1952 petroleum law.

Cia. Petrolera Peruana completed its wildcat NX-2 for about 500 bbl. daily of 38°-gravity crude at a depth of 4,200 ft. The company is owned by a Peruvian group headed by Augusto Gildemeister.

The well is in the extreme northwestern part of the Sechura Desert. It is less than half a mile south of the producing Portachuelo pool of International Petroleum Co., Ltd.

American companies have had a discouraging record of dry holes so far in drilling on prospects in the Sechura since it was opened up by the 1952 law. Union Oil Co. of California and Richmond Oil Co. pulled out after failing to find oil *(The Oil and Gas Journal, December 20, 1954, page 76).*

International, which has drilled several Sechura dusters, is continuing seismograph work.

Newest major company to enter the play east of the Andes in Peru's Montana is Gulf. The company has asked for 24 blocks of nearly 2,500,000 acres. Texas, Richmond, Socony-Vacuum, a German group, Union, and several Peruvian companies are in the early stage of exploration in the Montana.

Gas Field Hit in Hungary

Communist Hungary's state oil administration has discovered a new gas field, and the fuel is being compressed and shipped by rail to augment the gas supply in Budapest.

A recent Hungarian Government announcement said the field had been found in the Csomad district 18 miles northeast of Budapest and that its reserves were estimated at about 35,000,000,000 cu. ft. The gas was described as lying in pockets, each having about 2,800,000 cu. ft.

The gas is compressed into containers and shipped by rail to Ujpest, a Budapest suburb. From there it is moved by pipeline across the Danube to the Obuda gas plant which has been having difficulty meeting the city peak-day winter requirements of about 30 million cu. ft. The Obuda plant is already getting about 3 million cu. ft. daily of natural gas from the Lispe fields in the southwest part of the country.

Railroad containers carrying 80 cylinders, each 60 ft. in length and having a total capacity of 265,000 cu. ft., are being built. A pipeline is to be laid later from the new wells direct to the Obuda works. Since the Obuda plant can produce a surplus of coal gas during the summer months, the eventual plans are to use the pipeline in a reverse direction during the summer to carry surplus gas to storage in the depleted reservoirs in the field.

New Guinea Search Goes on

Another $9,000,000 will be spent this year in Australian New Guinea in a continued search for oil by a joint American, British, and Australian company.

The program, which started before World War II, is conducted by Australasian Petroleum Co., Ltd., and Island Exploration Co., Ltd., controlled by Stanvac, and British Petroleum, with 10 per cent interest held by the Australian company, Oil Search, Ltd. About $30,000,000 has previously been spent in the so-far unsuccessful exploration.

The program for Papua in 1955 calls for aerial photography over 4,000 sq. miles, reconnaissance of the delta and western Papua area, completion of the Omati wells and the Aramia wildcat, starting drilling at Kuru, and testing of at least one other location.

At Omati, a sidetracked hole is being deepened in the No. 1.

Production delayed at . . .

. . . Big Synthetic-Oil Plant

ALTHOUGH some of the units are being tested, start of production in the coal-to-oil synthesis plant of South African Coal, Oil & Gas Corp. Ltd., has been postponed until April.

The start-up schedule has been revised because testing and installation of equipment is taking longer than was originally anticipated, according to F. J. Du Toit, chairman of the company. The earlier goal for producing the first motor fuel was November 1954.

The plant's power station has been working for several months and is sufficiently advanced and tested to go into full operation at any time, Du Toit said. Completed sections of the oxygen plant have been in continuous operation for several weeks and the first gasifier has been successfully run on air.

The SASOL chairman said that the coal mine has been in production since June and is prepared to increase output as required. Underground conditions are favorable to mechanized mining, he said, and "there is no reason why we should not be able to deliver coal at the plant at the low cost originally anticipated."

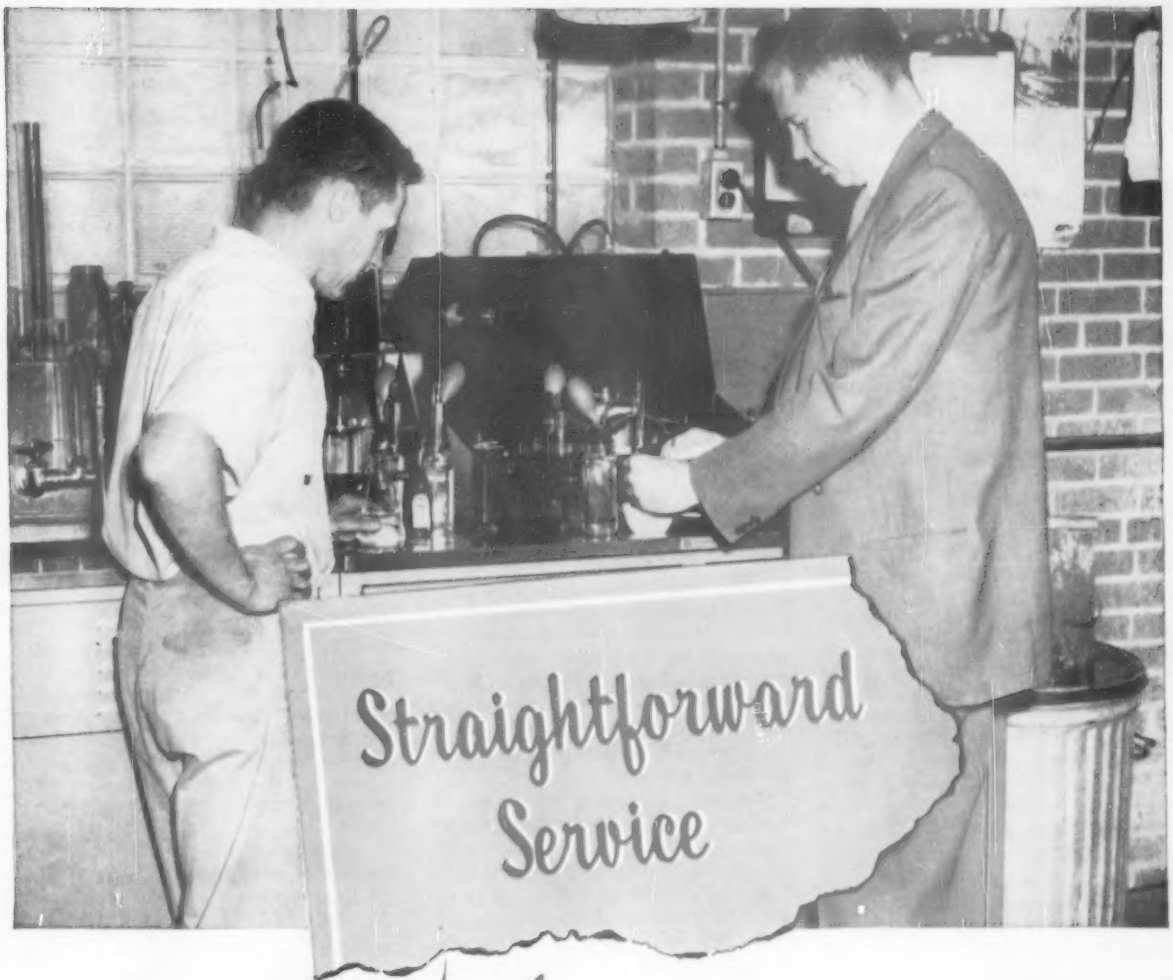
Delay costly . . . Du Toit pointed out that a 3-month delay in production could easily mean an added expenditure of more than £1,000,000, ($2,820,000). The additional expenditure, he said, would be in the form of interest charges, salaries, wages, and other administrative expenses, to be later offset against sales revenue.

SASOL is making an extra expenditure of £300,000 ($850,000) on additional facilities for blending and drumming and for more office and workshop space. This was made necessary, Du Toit said, as continued investigation of the market showed that both the waxes and solvents to be produced by SASOL would require further processing before sale.

In his review of the company's activities, Du Toit said that capital expenditure on fixed assets had risen to £26,775,942 (about $76,000,000) by last June 30.

The subsidiary Sasol Townships, Ltd., together with the parent company, will eventually spend £3,500,000 ($10,000,000) on township development and housing. This, Du Toit said, must be regarded as a contribution toward solving South Africa's pressing housing problem rather than as an expenditure required for producing oil from coal.

The SASOL plant, ranking as one of the largest undertakings of its kind, is situated at Coalbrook about 50 miles south of Johannesburg. Financing for the project has been provided by the South African Government. It is expected to produce about 5,550 bbl. of oil products daily.



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Reds Damaging Austria

Communists operate under a "milk-it-dry" philosophy that is fast depleting fields; half of production is exported

SUPPOSE the United States oil industry were seized by a foreign power which operated fields and refineries and exported most of the production.

This would force the country to meet its needs by buying oil and products abroad. Then when the foreign power finally did allow some U. S. oil on the market, it would price it higher than imported oil.

This roughly parallels what has happened in Austria since the end of the war. The Russians moved in, took an iron grip on the country's oil industry, and have refused to budge.

What's more, the prospect is for continued Russian control. The long-pending draft of an Austrian treaty has confirmed this Russian domination. It gives the Soviets 60 per cent of the production for 30 years, 8-year exploration and 25-year exploitation concessions, and much of the refining facilities. But the Russians have so far refused to sign the treaty even on these terms.

Different estimates have been made of the financial loss to Austria from the "milk-it-dry" Russian philosophy. In oil, it runs into several hundred million dollars. In all property, the Russians have drained an estimated $900,000,000 from Austria since 1945.

Half exported . . . Production from Austrian fields is believed to be about 21,000,000 bbl. a year, or 57,500 bbl. daily. Half this is exported by the Russians as crude and another 2,100,000 bbl. as finished products. The exports are used to meet Communist needs in the east.

Austrian crude oil is priced at the equivalent of $1.95 a barrel. The annual loss from exports work out like this:

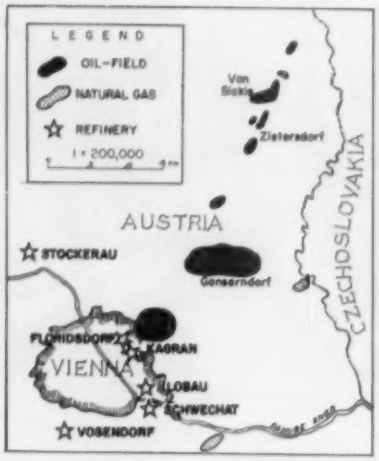
. . . Crude, $20,500,000.

. . . Products, $12,500,000.

. . . Total, $33,000,000.

For 5 years after the war, the Soviet Mineral Oil Administration (SMOA) shipped virtually all Austrian output to the east. The country was forced to rely on imports for its own requirements, in some cases buying back its own oil from Soviet satellites. Marshall Plan aid helped tide the country over during this period.

In 1951, Russia released an increasing amount of oil on the Austrian market, and imports dwindled to specialties. However, during the past year, the Austrians found that in some cases they could import products cheaper than those the Russians were offering—and that the quality was better.



By some strange lack of coordination between the Communist partners, Romania last March offered to supply Austria about $1,000,000 of oil products. Gasoline was priced at about $4.25-$4.60 a barrel, which even with freight added was some 30 per cent under the Soviet price for its Austrian products. Fuel oil at about $1.50 was roughly half the Soviet price. Early in 1954, when Austria liberalized petroleum imports, Italian gasoline appeared in Vienna at a price equivalent to 57½ cents a gallon (3.9 schillings per liter) compared with poorer quality Russian gasoline for 61½ cents (4.19 schillings per liter).

Production in Russian zone . . . All of Austria's oil production comes from a group of fields between Vienna and the Czechoslovakian border in the 3,000-sq. mile Vienna basin. This area is in the Russian zone of occupation. Most of the eight refineries are within and on the outskirts of Vienna.

First commercial production was found in Austria in 1934. During the prewar years, several foreign companies were active in the country, including subsidiaries of Royal Dutch-Shell, Socony-Vacuum, Standard Oil Co. (N.J.), and the Canadian operator, Richard K. van Sickle. The period from 1934 until 1938, when Hitler moved his troops into Austria and annexed the country, was devoted mainly to exploration with only a moderate amount of development drilling. Output hit a wartime peak of about 23,000 bbl. daily in 1944.

Russian success . . . The Russians capitalized on the careful prewar exploratory work but with greater success than the Germans. Several field discoveries were made, the most noteworthy of which was Matzen, about 10 miles northeast of Vienna. The structure had been mapped by the foreign companies. Although the Russians have consistently refused to disclose their production figures, Matzen is believed to be producing about two-thirds of the total Austrian output, or about 40,000 bbl. daily.

During the postwar years, the Russians have talked less about the Austrian operations. The Russian operators also have been producing the fields without regard to ultimate recovery. An Austrian report last year calculated the fields would be exhausted by 1972 because of Russian methods aimed at rapid and cheap producing results. This same report in the Austrian Socialists Newsletter said 18,000,000 tons of oil had been produced up to 1953, and that the Soviet administration had taken 12,000,000 tons, or about 84,000,000 bbl., valued at 9.3 billion schillings, or $363,000,000.

Soviet Report Made

Russia, now the world's third largest oil producer, aims at a crude production of 70,000,000 tons a year by the end of 1955.

The Soviet Union's status was pegged last week in a report written by the Library of Congress for the joint congressional committee on the economic report. The report says Russia may have more reserves than any other single nation.

There is no reason to believe the Soviets are short of oil resources. Nearly half the subsurface structures in the Eurasian area consist of sedimentary formations where oil may occur.

The report quotes one authority who thinks the ultimate yield may be as much as 168 billion barrels. Another estimate, including natural gas and undeveloped regions of Siberia, puts the potential at 195 billion barrels.

These estimates, the report points out, are in sharp contrast to the 29 billion barrels of proved reserves in the United States, 12 billion barrels in Latin America, and 62 billion of the whole Middle East.

As a result of the development of Matzen and other smaller areas, the Russians built Austria's crude production to a level higher than anything in Western Europe. Output rose from around 16,000 bbl. daily (845,695 metric tons) in 1946 to a reported approximately 62,000 bbl. daily in 1953.

From all reports, however, other exploratory work was considerably less successful. Twenty-seven dry holes were drilled, and after a Russian commission visited the Soviet zone in Austria in the summer of 1953, much of the exploratory program was suspended. Some drilling was continued. Early last year, the Soviet oil administration was reported to have found production in a second deep well in the Rabensburg area near the Czechoslovakian border and at Schonkirch, a few miles north of Ganzendorf.

Private companies . . . There are only two private producing companies allowed in the Russian zone. They are Roehoelgewinnings, AG (R. A. G.), owned 50-50 by Shell and Socony-Vacuum, and the van Sickle interests. Their production amounts to only some 2,500 bbl. daily, or about 4.4 per cent of the total. Although they are allowed control of their field operations as acknowledgment of their prewar ownership, they are required to deliver and sell their crude to the Soviet oil administration.

Another 1,500 bbl. daily coming from the DEA field (formerly van Sickle) could possibly be added to the 2,500 bbl. daily as the field has been restored to its owner by Austrian courts. The Soviets, however, do not recognize the procedure, claiming that the property was nationalized in 1946. Allied intervention to denationalize Allied property when restored has proved fruitless. The Russians assume there is no properly constituted ownership, and hold the area and take the production.

Refining . . . The Austrian refining industry consists of eight small plants with a total throughput of around 30,000 bbl. daily. Six of the refineries are operated by the Soviet oil administration. The other two are the Floridorfer plant of Shell and the Kagran plant of Vacuum Oil Co., AG., both in Vienna. They are dependent on the Soviet oil administration for both crude supply and market allocations. These two refineries have been running at about 44 per cent of capacity, and their market allocation amounts to only 14.6 per cent.

The six refineries operated by the Russians were originally owned by Austrian, German, French, Romanian, English, and Dutch interests.

Gas Option Granted

American firm studies use of Middle East production

OPTION on exclusive rights for the gas produced in Saudi Arabia has been granted an American service corporation.

The company is International Development Services, New York. It is a nonprofit technical service organization sponsored initially by Nelson Rockefeller and now financed from a revolving fund.

Its agreement with the Saudi Arabian Government gives it 14 months to finish a study of projects using surplus gas and to set up a financial organization to carry out the plans.

International Development Services' proposal to the Saudi Arabian Government calls for forming a company with 70 per cent American capital and 30 per cent private Saudi Arabian capital. It would have $25,000,000 capital and would take a concession for about 50 years on its operations. The Saudi Arabian Government would be represented on the company's board and would get 50 per cent of the profits through an income tax.

An official of International Development Services said his group did not have anything approaching a concession. He said the corporation was seeking to bring American and private Saudi Arabian capital into a joint company to develop now unused gas. Nothing in its program will weaken Arabian American Oil Co.'s position, he said.

Projects . . . Among projects under study by International Development Services are channel black, sulfur, urea, power, and liquefaction. This last is the as-yet untried method of shipping gas long distances by barge or tanker in the liquid state.

International Development Services also is attempting to work out plans for gas use in other Middle East countries. Iran, where oil production is now building up again after the long nationalization shutdown, offers prospects along this line.

Setting up a plant in the Persian Gulf to make use of oil-field gas raises a number of problems. First of all is the matter of price and markets. Another question is just how long the gas now being flared will be available. The oil-company's needs come first, and more and more Middle East gas will probably go for field repressuring.

Any gas project in the Middle East also comes up against the fact that how much gas is available depends on the level of oil production. There are no gas fields as such on which a project could depend for a steady long-term supply.

Refinery to Expand

Shell and Caltex to supply crude for big Spanish plant

SPANISH Government interests controlling the 45,000-bbl. daily Escombreras refinery have signed long-term crude supply contracts with Shell and Caltex as part of plans for expanding the plant's capacity.

The source of the refinery's crude has been changed. Caltex, which owns 24 per cent interest in the plant, has been furnishing the entire crude supply. Under the new contracts, Caltex will supply only 75 per cent and Shell 25 per cent.

Sources in Madrid say the savings from the new crude-supply contracts will be used to implement the plant expansion. The government recently authorized stepping up throughput to 3,500,000 tons annually, or about 70,000 bbl. daily.

The refinery, which is near Cartagena, is controlled by the government's Instituto Nacional de Industria (I.N.I.), which holds 52 per cent interest. The operating company, Refineria de Petroleos de Escombreras, S.A., has authorization to increase its capital by about $13,700,000, with I.N.I. contributing enough to maintain its 52 per cent holding. It is the only large refinery on the Spanish mainland.

Calvo Sotelo Co., owned by I.N.I., is planning construction of a new refinery at Puertollano in Ciudad Real Province. Calvo Sotelo carries on small shale-oil extraction operations at Puertollano, and the plans call for processing this shale oil as well as imported crude.

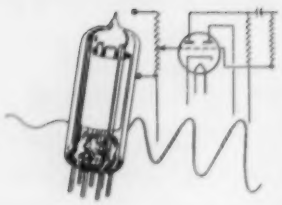
Rubber Plant Planned

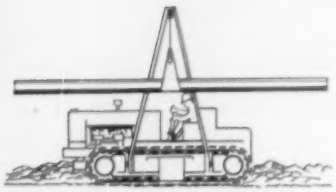
A synthetic rubber plant to use by-product gases from two large French refineries will be built in the Le Havre area.

The plant will have a capacity of 20,000 tons of butyl rubber a year. It will save France the equivalent of $5,000,000 a year by reducing its rubber imports.

The operating company is backed by two oil companies, three tire manufacturers, and five chemical companies. The oil companies are Esso Standard, S.A.F., and Cie. Francaise de Raffinage, which is affiliated with Cie. Francaise des Petroles. The plant will use gas from Esso Standard's Port Jerome refinery and C.F.R.'s Gonfreville refinery.

Future Is Wide Open . . .





Aside from the normal use in communication and station control, electronics is now being widely applied to specialized problems in all related phases of pipelining. "Talking" volumetric meters for remote transmission, a three-station totalizer-ticket printer which speeds truck deliveries, and a counter which may be switched to any one of several meters at a station and which "catches up" with their reading in a matter of seconds —these are some of the electronic devices now available to improve pipeline operations.

Construction and maintenance have not been forgotten. One device, when pulled through a river crossing, gives an accurate profile of the line's elevation. Another can be sent through a crossing to pinpoint leak locations. The future for pipeline electronics is wide open; certainly it will be applied in areas that have here-to-fore been considered the private domain of mechanics and hydraulics.

What's New in Pipeline Electronics?

by C. C. Keane

SINCE electronics has invaded the field of heavy industry it is no surprise to find its application to the solution of pipeline problems under serious consideration.

One of the largest investments at the moment covers the field of communication where microwave frequency has made rapid strides in providing an economical means of voice transmission for teletype and for control circuits. Slower progress is being made in utilization of electronic equipment as a replacement for old-style hydraulic, electric, and mechanical instruments at pumping stations.

In product-pipeline systems where terminals are part of the operating arrangement, electronic apparatus offers new avenues to quick and accurate methods for consolidating data pertinent to stocks and supplies and also for the control of power equipment. However, before detailing the advantages available through the electronics field, we might inquire what connotation the word electronics has for the pipeline operator. In what way does it differ from electric control and is it a panacea for all control problems?

Fantastically fast performance . . . Perhaps one of its most fascinating uses pertains to the so-called application of radar in the location and detection of aircraft. Here we haye a method that is fantastically fast in its detection of a moving airplane; its velocity is so great that ordinary units of time are not used. The term microsecond, which is one-millionth part of a second, is the standard unit of time applied to radar electronics.

As a practical problem consider an airplane traveling at 600 m.p.h., flying at a distance 100 miles from a radar detection station. The electronic radar beam locates the aircraft and reflects its position back to the station in 1,000 microseconds, that is in 1/1,000 of an actual second and in that time the plane has moved less than 1 ft. Another interesting application is the time it takes an electronic radar pulse to reach the moon and return—slightly more than 2½ seconds, and in that period it has traveled 476,000 miles! Is it any wonder then that the pipeliner, be he operator, engineer, or executive, is somewhat baffled by the potential of electronic apparatus and its beneficial application to the solution of his problems.

Since the field of pump station control has been extensively covered in the past, no attempt will be made to elaborate further concerning it. Our efforts will be towards the detail and application of electronics and kindred equipment for the solution of specific problems.

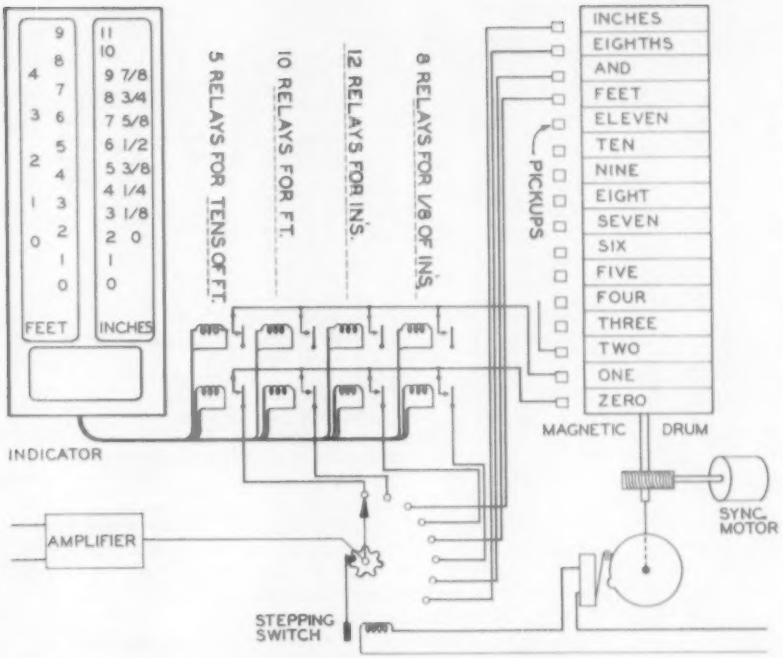
Transmission of meter readings . . . Consider displacement meters, always an interesting subject. In what manner can the hourly flow rates or for that matter, momentary readings, be accumulated and transmitted from a remote location? Evidently the particular section of the meter assembly with which we must concern ourselves is the counter. Here the information that we need is generated through a continuing accumulation of digits on the visible indicator.

A circuit arrangement to satisfy the demand for remote transmission may be produced by adapting features now incorporated in a long-distance tank gage presently being used by Great Lakes Pipe Line Co. The gaging levels in feet, inches, and fractional inches are converted to voice and transmitted over a telephone or microwave circuit to a central control point.

Descriptively the apparatus incorporates the following features: (1) A magnetic voice-storage drum which is unique in its approach to the voice-storage problem. (2) A set of voice-pickup units that do not make physical contact with the storage drum. (3) A stepping switch that connects each pick-up with the gage relay which happens to be excited at the moment. (4) An interrupter to rotate the stepping switch. (5) A synchronous motor to turn the storage drum. (6) A standard step-increment electric gage that indicates each ⅛-in. change in liquid level.

Uses new magnetic principle . . . The voice drum while utilizing the magnetic principle for storage recording, differs substantially from the conventional

Author is chief engineer, Great Lakes Pipe Line Co., Kansas City, Mo.



VOICE TELEMETERING principle used in this "talking" tank gage can be applied to integrating meters for remoting to central office. Fig. 1.

magnetic system in that field strength is not used in the standard manner. The new principle is known as boundary layer differential storage and it follows the pattern of varying the width and strength of north and south polar configurations across a band of limited dimension. It has the singular advantage of not requiring physical contact between the pickup head and the sound track, hence no wear occurs along the drum sound track and the quality of delivery is not impaired.

In essence the drum for gage service has 16 words recorded in individual boundary-layer channels. This is a sufficient vocabulary to describe any level at which the liquid stands.

A schematic circuit arrangement is shown in Fig. 1. The gaging operation takes 7 seconds to complete and any number of tanks up to the maximum limit of that dictated by the control time period may be voice checked through one magnetic storage assembly.

Applicable to volume meters . . . A modification of this arrangement adapts quite well to remote transmission of metered volumes. A single magnetic storage drum may be used for a large number of meters. Since the metered increments integrate much faster than gage levels the modification required is substantial. An acceptable arrangement provides a method of sealing the meter indicated volume at a specific time. The mechanism does not interfere with the normal function of the meter indicating integrator. By retaining a reading at a specified time it is quite feasible to scan it and also transmit it as voice information on a telephone circuit.

Equipment to accomplish this is commercially available and at least two companies now offer it for sale. In principle it includes rotating drums with a series of circular cam lobes projecting above the cylindrical surface of the drums. The circuit is arranged for a binary decimal output code and there are sensing feelers and coded wheels in the assembly. The design also includes a mechanism that permits momentary stoppage of the readout drums without uncoupling the input shaft. By using such an arrangement it is thus possible to lock the counting drum in numeral alignment with meter counter after the readout is completed. Since the sensing feelers do not make contact while the drum is in motion, no wear occurs from this source. A solenoid positions the readout feelers.

In further explanation of the circuit each feeler is wire connected to each voice pickup head and energizes this head whenever the drum position dictates it. If there are seven digits in the meter integrator, seven pickup heads are adequate for transmission service. However, additional words such as "Barrels," "Meter Number," "Product," "Time," and other pertinent information may be included in the magnetic storage. A selector switch with stepping actuator shifts from each channel of magnetic storage to the next in consecutive order. The pattern is arranged for a descending order with the digit on the left-hand side of the number read first.

While the system as applied to tank gaging has been in use for a year, it will be some months before it is installed as an operating device on meter service. Like all new mechanisms it probably will contain a quota of initial problems; however, the fundamental circuit is quite dependable and problems as such should not be beyond resolution.

Multiple ticket printers . . . Another electronic device that appears to have considerable potential in the products terminal field is the multiple printer. Fundamentally, it is an electronic counter connected by a coaxial cable to a series of truck loading meters. The initial unit developed about 18 months ago is designed to receive digital information from any group of three meters out of a total of nine. It requires 84 combinations to complete all possible groups of three.

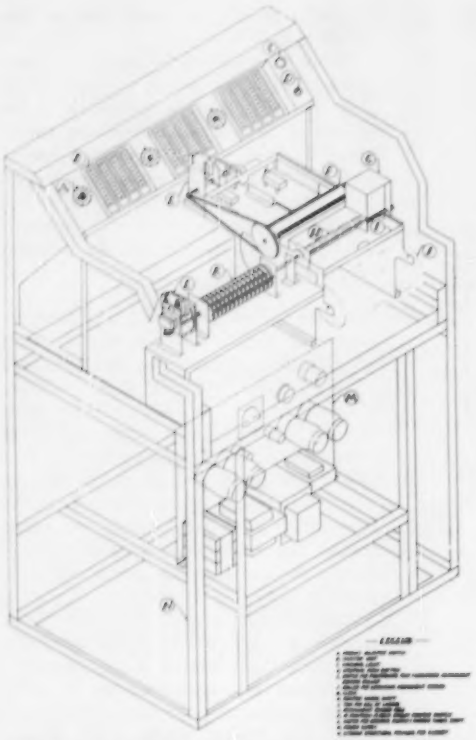
The multiple printer has many novel features. It receives the digital information from three meters simultaneously. The count is transmitted by a pulse switch located at each meter head and while the circuit sends only binary count, the electronic blocks convert it to a decimal notation. Speed of operation has little effect on performance, principally because the counting blocks have an upper limit in counting of 100,000 beats per second. Fig. 2 shows the details of assembly and the circuit is outlined schematically in Fig. 3.

We may now ask what are the advantages and benefits, if any, of this type equipment. Also is it primarily useful in satisfying the singular needs of the company which designed it or does it have potential beyond selective applications? Perhaps an operating outline of its principal function will help answer some of the questions.

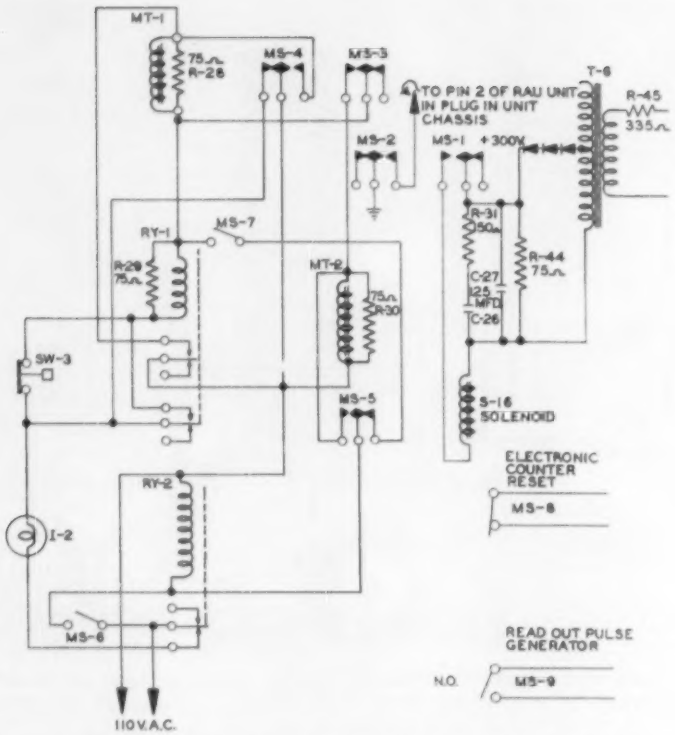
Reduce loading time . . . First, let us discuss product-truck-loading problems at a common-carrier terminal. On a typical day, we find trucks arriving in great profusion between 8 a.m. and noon. Many of the carriers may need three distinct products in a transport. For example, a 6,000-gal. truck may have orders to get 1,500 gal. of premium gasoline, 2,500 gal. of regular, and 2,000 gal. of No. 1 fuel oil. Let us say the loading rate on all three products is 500 g.p.m. Under the present system with only one bill of lading, quite evidently the loading time is:

$$\frac{1{,}500 + 2{,}500 + 2{,}000}{500} = 12 \text{ minutes}$$

This does not include the rack time essential to process the actual product spill operation. Much of the delay is



MULTIPLE TICKET PRINTER used at loading racks cuts truck loading time in half. Fig. 2.



ELECTRICAL SCHEMATIC of multiple ticket printer. Fig. 3.

caused by moving the bill of lading from one product meter to another. In using the electronic multiple printer, all products may be loaded simultaneously. The actual product flowing time is the quotient resulting from the largest single volume of products specified, divided by the meter rate in gallons per minute for that product, or using the last problem as an example:

$$\frac{2{,}500}{500} = 5 \text{ minutes}$$

The flowing time here is approximately 42 per cent of that required when individual products are loaded consecutively.

Time and labor saved . . . An equitable application of this device saves thousands of dollars in labor and particularly in the more productive use of loading facilities. If need be, it may also be installed in an office remote from the loading operation, and it may be modified for pipeline service to receive and record the total and momentary flow rates from a series of meters located sporadically at outlying locations. Its count rate is so fast that the output of several meters may be cascaded to integrate in one set of electronic blocks by a simple switching of the circuit.

Another feature, now in the development stage, that may well bring about an appreciable saving in the time it takes to read the rates and output of present pipeline meters is labeled the "catch-up counter" for want of a better name. In operation it would function as follows:

For the sake of discussion, let us assume several meters are located at outlying points remote from a central office. All are connected by coaxial cable to a receiving multiple counter and printer. The electronic counter starts at zero, but in its circuit is a multivibrator capable of an output frequency of 100,000 cycles or pulses per second. If the actual count on meter "A" is 875,268 bbl., it takes approximately 8¾ seconds for the electronic counter to catch up with the meter count. When the values coincide the electronic unit falls into synchronized step with the meter. Since it may be electrically disconnected and returned to zero, it is quickly made available to check any number of meters within the time limit allocated to the operation.

Electronics for Maintenance

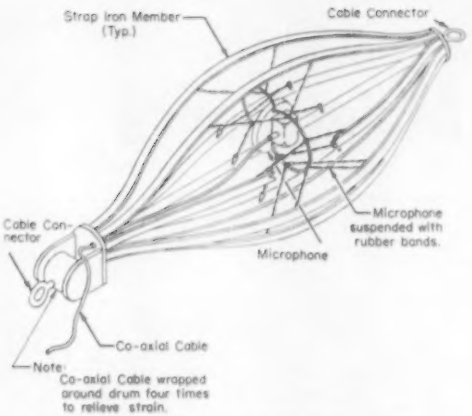
A device using an electronic amplifier in its assembly may prove quite beneficial to liquid and gas pipelines at major river crossings. It may be used to locate accurately small leaks, particularly in areas where silt and water-cover dissipate the characteristic bubble stream. The theory on which it functions was tried experimentally before an actual test was made.

It was postulated that the noise of a small leak generated by pressurized gas or air inside a pipe is exceedingly sharp at the point of leak. Laboratory tests confirmed this and a detecting device was built for a 12-in. line on a major river where a small leak was suspected.

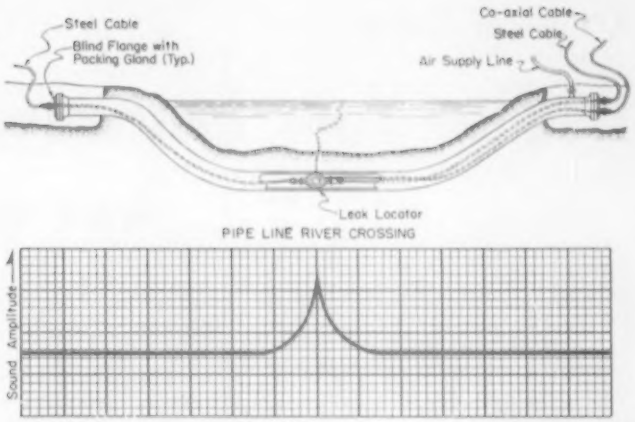
The apparatus is shown schematically in Fig. 4. Descriptively, it is as follows: A small geophone is carried in a rubber-band mounting supported by rollers fore and aft. To the mounting is fastened a small No. RU-59 coaxial cable and to the other end of the cable an electronic amplifier calibrated in decibels is connected. When the geophone moves into the close proximity of a leak inside a pipe the noise level rises appreciably.

Successful field test . . . The details of an actual application of this equipment to practical use may prove interesting. Approximately 1,900 ft. of 12-in. i.d. pipe was used in the test. Pressure checks had indicated a small leak in this line, and in order to localize the point of trouble the line was cut loose on both sides of the river. The line fill was removed by water and the water was in turn pushed out by rubber-disk pigs, air driven.

When all the water was out a rubber-disk pig was used to pull a ⅜-in.



LEAK LOCATOR consists of sensitive microphone which feeds back to amplifier at open end of line. Fig. 4.



DETAILS OF LEAK LOCATOR'S application in pin pointing a river-crossing leak. Fig. 5.

stranded cable with a breaking strength of 6,000 lb. through the pipe from one side to the other. Air at 100 psi. was used to drive the pig and the cable was fed off a reel through a packing gland at the input side, see Fig. 5. With the cable in place the geophone was now placed in the line, the open end of the pipe was sealed with a blind flange carrying two packing glands, one gland for the ⅜-in. traction cable and the other for the geophone coaxial.

The other end of the river line was also sealed and a reel was installed to wind the traction cable and pull the geophone through the pipe. By using walkie talkies, the engineer at the input end controlled the whole operation.

When the line was sealed at both ends air pressure to the extent of 120 psi. was generated and movement of the geophone started from the water's edge. The line entrance point was approximately 200 ft. back from the water's edge. In order to minimize the effect of extraneous noise the geophone was moved in increments of 10 ft. following which all activity stopped in order to read the noise level in decibels.

Leak pinpointed . . . Everything went along smoothly until the 590-ft. mark was reached. At that point a decided increase in noise level was noted. In order to check the area precisely, the geophone was withdrawn to the 580-ft. mark and it was then moved forward by 1-ft. increments.

At the 589-ft. station the noise level rose to a maximum and on either side of that point it dropped off appreciably. Several passes were made through the 589-ft. station and each one indicated maximum intensity at that point.

When the line was dredged clear of silt and raised, the leak was within 3 in. of the point indicated by the instrument. Prior to raising, a diver attempted to make an underwater repair. It was not successful because of the high pressure, 1,200 psi., at which the line operates.

The advantage of precise location is readily appreciated by those who wish to make a repair with as little expense as possible. In passing it is well to note that the higher the actuating pressure the sharper the indicating signal and more precise the leak location.

Aids for construction . . . A measuring device known as a Vibrotron is currently being used for specific applications in the field of oil production. It is extremely sensitive to slight changes in temperature and pressure and since its indications may be amplified by electronic means it has considerable application potential in the pipeline field.

One such use is in determining the depth of petroleum and gas lines in rivers, relative to a land bench mark. In dredging lines to a specified level while under construction or to provide a means of checking the elevation location of operating lines, this device should prove invaluable. It is a development of the Southwest Research Institute, of San Antonio.

In its simplest form it consists of a framework across which a vibrating wire element is stretched. To change the vibratory period, one end of the framework is arranged to yield to the force under measurement. A magnetic field provided by two pole pieces surrounds the tension wire. The wire is driven into a vibratory motion and since the motion follows the basic formula for vibrating strings, it is possible to correlate the fundamental frequency of its condition as a function of the influence causing it.

In river line surveys the influencing environment is the shift in barometric pressure as the line changes elevation on its way to the bed of the river. Since the Vibrotron is capable of detecting elevation changes with an accuracy 0.5 per cent in a range of 50 ft. it takes the guess work out of a line's elevation even in the most turbulent water. In operation the device is simply pulled through the pipe with a traction cable and at predetermined points along the route it is stopped and magnetically excited through its coaxial circuit. Following excitation, elevation of the instrument is determined from its vibratory period and this in turn is the location of the pipe at that point.

A precise profile relative to a land bench mark may be made by this method. If used in conjunction with a sonic depth finder a comparison of the depth records may be made to show the extent of line cover.

Future expectations . . . Undoubtedly the future will produce new solutions to pipeline problems by way of electronics and we should expect to see many interesting devices as time progresses. In this category is the transistor with its rugged framework, its small power requirement and its high degree of sensitivity. It may be the means by which plugs run through pipelines will provide answers to current problems.

Electronics is not a cure-all for all pipeline control problems. It is best applied when fast response to small signals is required or where remote operation is desired. Even with these restrictions, electronic *devices* will be used increasingly in all phases of pipelining.

Try these tips to

Reduce Your Instrument Maintenance

by E. D. Mattix

GOOD instrument application and engineering that will reduce maintenance are made up of a lot of big and little things. For example:

1. Make clear concise drawings and specifications.
2. Keep personnel fully informed on important instrument characteristics.
3. Use mercuryless manometers in difficult applications to save maintenance.
4. Reduce cat cracker slide valve wear by using properly sized and shaped valve port.
5. Use wear guards on thermocouple wells.
6. Wear and tear on external float or displacer liquid-level controllers can be eliminated by use of gas purge or steam tracing.
7. On control valves employ bolted-type packing glands rather than screwed types.
8. Watch your shop facilities—include well-equipped pressure-gage test board and tank on wheels to transport instrument sealing fluid.
9. Keep a complete card file up to date—this will help to show where service is severe and improvements needed.

These and many other items are dealt with more specifically as follows:

Author is assistant process superintendent for engineering, Cities Service Oil Co., at Lake Charles, La. Paper presented at Texas A. & M. Instrumentation symposium, January 25-28, 1955.

Instrument drawings . . . Preparation of the instrument drawings should be done in a clear, concise, graphic manner; present a clearly understood picture of the instrument application to the engineers and instrument men who will later work on the units. In Fig. 1 is shown a method of a presentation of the drawing commonly used thoroughly to confuse everybody concerned except the man who originated it. One can see that it is composed of equipment logically arranged to enable the draftsman to draw a Chinese maze of lines around over the paper which makes the man following the lines concentrate on the problem of not getting lost so that he will be unable to comprehend the process as he proceeds through the drawing.

In Fig. 2 is an instrument drawing set up to give the fewest number of lines crossing which allows the man to mentally coast through the drawing while he concentrates on the process. With this type of drawing he is able to comprehend the over-all problem in the least amount of time. Note that all square turns are eliminated, that even the instrument symbols are drawn to act as directional arrows for greater clarity. *(Ed. note: for more on this see "Quick Reading Flow Sheets—Here's How" in The Oil and Gas Journal, July 21, 1952, page 80.)*

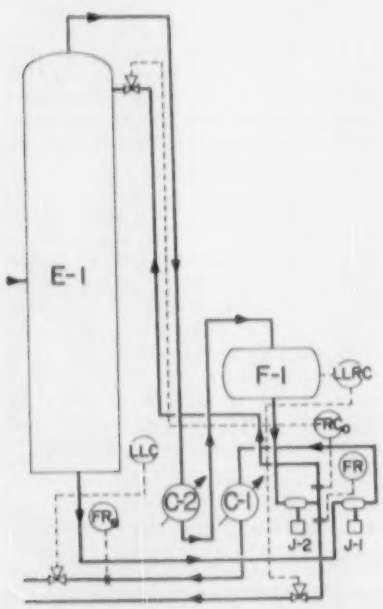


Fig. 1—This maze of crossing lines in an instrument drawing makes it tough to follow the process.

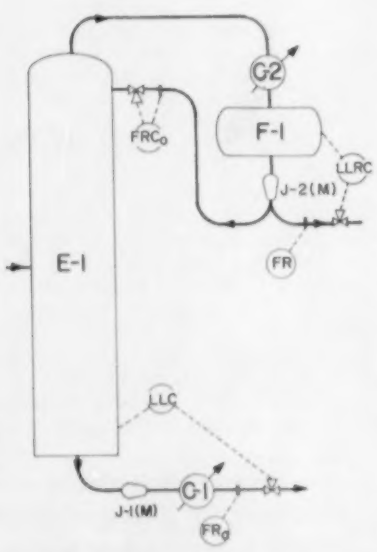


Fig. 2—By contrast this type of drawing gives fewest number of lines crossing and is easy to follow.

Instrument specifications . . . There are two general methods of writing up instrument specifications. The one in general vogue today is only shorthand for writing of a good set of instrument specifications. The other (Fig. 3) would be prepared by a capable, competent man with proper forms transcribing these meager remarks into a clear, concise, fully explanatory set of specifications that would inform the operator as well as the instrument man what the duty of the instrument is and also what type of instrument he is to use as well as various deviations from the normal instrument. This will eliminate a lot of confusion, misinformation, and needless searching later when the unit is to be started up and for years after it is put on stream.

Screen cleaning . . . If a pressure gage is located with one tap upstream and the second tap downstream across various types of screens (this even applies to coolers) it will enable the operator and/or instrument man to know when this screen should be cleaned, thereby saving many hours wasted in cleaning the screen when it is not needed or saving the equipment by cleaning the screen at a time when it is needed and not normally scheduled.

Mercuryless manometers . . . We have replaced several mercury manometer-type instruments with a small compact type mercuryless manometer with very little displacement in bad catalyst control problems (the type where the catalyst is constantly filling the manometer with backflows). The catalyst does not flow back into the mercuryless instrument and in case it does fill the line, it can be blown out without disassembling

0-50 Rev. 2

CITIES SERVICE REFINING CORPORATION
INSTRUMENT SPECIFICATION SHEET

Location: Hydroformer Unit
Job No.: 5079-XIV

Page No.: 423
Date: 12/22/54
Revised:

Item No.: FRCa-23
Manufacturer: Foxboro Company

Class: Flow Recorder Controller
Type: Stabilog Control, Pneumatic Transmission

This instrument shall conform to C.S.R.C. Std. Instru. Spec. E-45
Dated: 12/21/44, Revised: 10/1/51 except as noted below. And Alternate #2.

Tagged: Xylene Splitter Feed Flow Controller
Service: To control the flow of Feed to Xylene Splitter E-6 by throttling a valve in Feed Line to Tower.

Location of Transmitter: Local — Mounting: Yoke
Location of Recorder Controller: Control Room — Mounting: Flush
Recorded On: — 2nd Pen: LRa-9
Chart No.: 898074 — Graduated: 0-10 sq. rt.
Meter Capacity: 10,000 B/D — Line No.: 0-185 — Orifice I.D.: 2.738"
Meter Factor: 1,000 B/D — Size: 4" sch. 40 — I.D.: 4.026"
Manometer Range: 100" H_2O — Swedge To: None — I.D.:
Fluid: Hydrocarbon Liquid — Taps: Flange
Pressure: 120 psig. — Flanges: 300#RF
Sp. Gr. at 60°F.: 0.854
Sp. Gr. 0.730 and Viscosity at 337 °F. Flowing Temp.
Seals: None With — Sp. Gr. at 60°F:
Location of Control Valve: Line 0-185 — Air Action on Flow Increase: Decreases
Valve: Closes On Air Failure — Closes On Flow Increases

CONTROL VALVE

This instrument shall conform to C.S.R.C. Std. Instr. Spec. E-5
Dated: 11/30/44, Revised: 10/10/51 except as noted below:

Manufacturer: Mason-Neilan Regulator Co. — Type: 138-3
Line Size: 4" — Body Size: 3" — Reduced Ports: None
End Connections: 300#RF — Body Material: Steel
Cooling Fins: None — Body Rating: 300#
Valve Positioner: Mason-Neilan
Plug Type: V-Port — Trim: 18-8 SS — Valve: Closes On Air Failure
Fluid Flowing: Hydrocarbon Liquid — Sp. Gr. at 60°F: 0.854 — Temp: 337°F
Inlet Pressure: 116 psig. — Pressure Drop: 43.3 psi. — Flow: 224 gpm.
Approx. 15% flash vaporization occurs through control valve.

NOTES:
1. Transmitter is a Type 3A D/P Cell, steel body with Z-Nickel diaphram. Body is tapped for 1/2" NPT.
2. Flow is indicated locally by an Ashcroft, Type 1079A-XPR, Pneumatic Receiver Gage, 4-1/2" face.
3. Tower Feed is Primary Flow of Ratio Controller FRRCa-34, see page 434.

Fig. 3—How to make a clear concise set of instrument specifications is shown here.

the instrument. This has eliminated many man-hours of needless repetitious maintenance work. The particular instruments in mind were installed with one pressure tap above the precipitator slide valves and the other tap below these slide valves. The purpose of the instrument was twofold: One was to maintain the catalyst level above the slide valve, and the second to prevent excessive catalyst flowing through the valve plugging up the catalyst carrying line downstream of the valve.

Catalyst control and measurement . . . In such problems we have found that it is of advantage always to locate the instrument at or above the upper pressure tap, which helps prevent the instrument taps from plugging in cases of bleed air failure, and in case the bleed air trouble is corrected, it has a directional tendency to purge out what small amount of catalyst has accumulated in the line.

More mercuryless manometers . . . We have installed recorders to show flooding on five towers in the refinery. These towers are all low pressure and it is possible to purge all of the instrument lines with gas. To minimize this purging and its attending maintenance, mercuryless manometers were used, located at the top pressure tap and at the same elevation. This eliminated the necessity for bleed on the top tap, and as the second tap was below the instrument, only the minimum quantity of gas purge was needed to prevent the condensables from collecting in the line. And in case the gas purge was shut off, the line was cleaned once the gas flow was started.

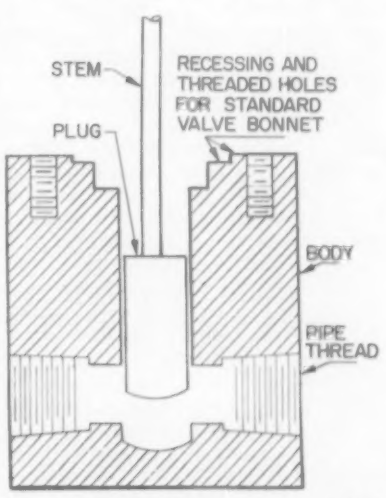


Fig. 4—This single-seated noncharacterized valve has been found best in the control of liquids that contain solids which tend to bridge control-valve ports.

And still more . . . A big field for the mercuryless manometers has been found by us in cases where seals were needed either due to freezing of the flowing liquid in the meter lead lines or due to water in the flowing liquid. This is also beneficial in cases of gas flows where portions of the gas can condense out in meter lead lines and manometers. However, many errors have been made in the past of locating the manometers either above or below the instrument taps. It can create a hydrostatic head equivalent to the distance between the meter tap and the manometer, thereby causing an error in the meter reading of sufficient magnitude to cause the meter to be definitely misleading or useless.

When a 100-in. manometer is used, only a few inches difference in elevation can cause large metering errors. Even a 16-in. difference in elevation can cause the meter to read 40 per cent of the instrument capacity at zero flow through the line.

Slurry liquid level . . . We have found the use of a pressure controller an ideal instrument for controlling liquid levels in open slurry and chemical tanks. The piping is always run overhead through the top of the tank and then back down to the proper elevation. The pressure tap is vapor purged. In this manner the instrument does not plug up or corrode out when the purge is discontinued for short periods. There are no floats to foul or corrode out.

Single-seated valve . . . We have found highly characterized oversized double-seated control valves to be disastrous in the control of liquids that contain types of solids that bridge control-valve ports. The control valve will act as a strainer due to the close clearance between the valve and the seat. The valve slowly opens as the plugging increases and ends up wide open at zero flow, or at a definite point of bridging, the bridge breaks down causing an excessive flow and the cycle starts over again. In this type of service we have found a single-seated noncharacterized control valve (where the fluid flows directly through with no turns) to be best, (Fig. 4). However, a noncharacterized angle-type control valve is a good substitute.

In specific conditions for single-seated control valves, always be sure

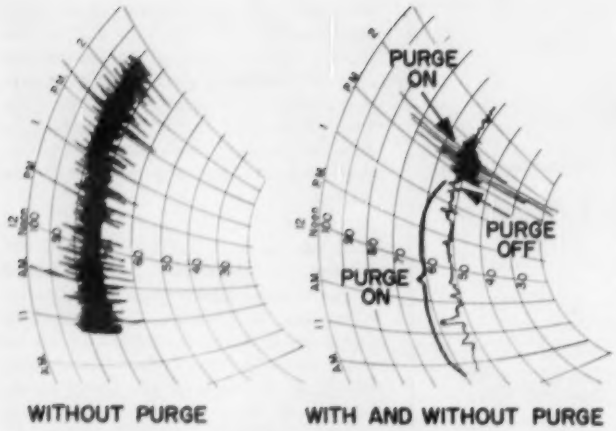


Fig. 5—What happens with and without gas purge on level controllers in steam strippers. Purge eliminates bouncing of instrument.

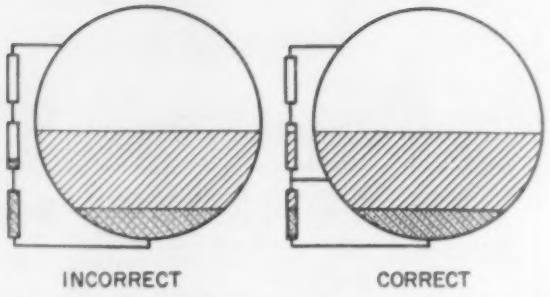


Fig. 6—Use of intermediate connection (right) gives proper reading on two immiscible liquids in tank.

to specify the maximum pressure drop that can occur on this type of mechanism. We can find in extreme cases the plug unbalanced equals or approachs the diaphragm force which can set up a self-perpetuated cycle sometimes shaking the piping and valves to pieces.

Rotameter . . . We have found the magnetic-coupling-type rotameter to be a big improvement over the mercury manometer-type meters for acid-type flow. The maintenance is reduced by elimination of purge, seal pots, and manometer cleaning due to overranging. The installation is much cheaper and many man-hours can be consumed in cleaning up mercury manometers.

Caustic metering . . . Mercuryless manometers located as close to the taps as possible save many man-hours on caustic metering. The man-hours are consumed in cleaning manometers due to overranging. This type of maintenance reduction is especially desirable due to the possibility of caustic burns.

Cat cracker slide valves . . . We have found the wear of catalytic cracking unit slide valves is minimized by several factors: (1) Keep the valve port as small as possible to minimize the wearing surface. (2) Keep the port shape square or rectangular; otherwise, the valve will be worn at the tip. Then on further closure the worn portion will be located under the side of the seat thus leaving an opening for catalyst flow between the parallel surfaces causing severe erosion. (3) Make the overclosure of the valve on all four sides as great as possible. This requires a longer pattern for the catalyst to flow through the parallel surfaces between the valve and port sides, resulting in less velocity, and therefore, less erosion. The overclosure on the side opposite the valve stem is metal that must be worn off before the valve is useless, thereby giving greater life.

Thermocouple wells . . . Thermocouple-well life was found to be extremely short in high-velocity, vapor-phase catalyst flow. This necessitated installation of removable thermocouple wells. To reduce this maintenance item to a minimum, wear guards were installed upstream ahead of the thermocouple wells. The wear guards were wedge shaped with an angle equivalent to the total angle of the outlet of the venturi. This causes very little disturbance in the stream flow resulting in extremely long guard and thermowell life, in many cases 2 years. This has eliminated another hazardous maintenance problem. The thermocouple wells prior to guard installation had to be removed once a month.

Valve in bypass . . . The use of "please" control in instrument application can be time consuming for the instrument maintenance man as he is frequently called by the operator and after investigation he finds that the instrument is only out of range. Here we refer to please controls as those which do not have complete control of the particular portion of the process, such as a control valve located in the bypass around a heat exchanger. As the control valve opens, flow is diverted around the heat exchanger reducing the pressure drop through both the control valve and the exchanger. This results in a control valve that is always undersized when it is near its open condition and always oversized when it is closing since the pressure drop is increasing as the valve closes and decreasing as the valve opens. This type of condition can usually be corrected by installing a second control valve with differential pressure controller in series with the exchanger. This controls a constant differential pressure across the exchanger and valve.

Eccentric orifice . . . We have found the use of off-center orifice plates to be perfectly satisfactory in the measurement of fluids containing solids that would build up upstream of the conventional orifice plates causing a metering error. The bottom of the hole in the orifice plate should be flush with the bottom of the pipe in which case the meter taps should come off the sides of the flanges.

Bouncing of level controllers . . . The use of gas purge or steam tracing on external float or displacer-type liquid-level controllers in stream stripper applications will eliminate the bouncing that wrecks the instrument after a short period of service. The bouncing is caused by drops of water condensing on the top inside surface of the float cage, dropping to the bottom where they hit the hot oil, flashing the water to steam. This causes a sudden pressure rise in the cage forcing the liquid level down with an almost immediate rise to normal or above. Without the purge, maintenance on this type of instrument is very high and the instrument is very unreliable, (Fig. 5).

Snubber . . . Spring-loaded pressure controllers can set up a self-perpetuating cycle in liquid service. This condition can easily be eliminated if a pressure-gage snubber is installed on the pressure lead line to the top of the diaphragm. This gives an added throttling range to the instrument and eliminates the cycling.

Disseminate instrument information . . . Complaints have been received on many occasions from the operating department stating that the control valve was too small for the service. Upon investigation it was found that the control valve was operating at approximately 80 per cent of its physical travel. This means that the valve was operating at approximately 50 per cent capacity opening. This problem can be cleared up by preparations and dissemination of information on the percentage of control-valve capacity with per cent of stem travel.

Transmitter location . . . Transmitters and/or direct-connected controllers should be located adjacent to and visible from their control valves wherever possible. This also applies to flow recorders where the streams are manually controlled. This permits both the instrument man and operator to see action of the instrument and control valve which enables him to tie the picture together much better than he would were the location otherwise.

Bolted-type packing glands . . . Control valves with screwed-type packing glands were found to be a source of maintenance and definitely a fire hazard. In case a control valve starts sticking, the first reaction of the instrument man is to loosen the packing gland to see if it is too tight. After this is done six or seven times, the packing-gland cap comes off spraying oil or other material all over the area. We believe that the bolted-type packing glands should be used exclusively on all control valves.

Gage glasses . . . Due to difficulty with long gage glasses on the base of fractionating towers, we have limited the length to 5 ft. Since gage glass acts as a condenser and operates at a lower temperature than the tower, long sections can cause breakage of nipples connecting the columns to the tower due to differential expansion. A gage glass in this service always gives a misleading high reading and the per cent of high reading observed is dependent upon its length and the free opening in the gage-glass cock. If more length than 5 ft. is needed, we require either a separate set of connections on the tower or the installation of a pipe column with short sections of gage glasses on this column. Often operators inform the instrument man that the level instrument is wrong on the base of the tower as they always rely on gage-glass reading. A thorough check frequently reveals only an error in the gage-glass reading.

Reading liquid level . . . Much difficulty can be experienced trying to read the liquid level in a vessel where two immiscible liquids exist, if the lower gage-glass connection for the lighter liquid is below the interphase, or when trying to read the level of the heavier liquid the top connection is installed above the level of the lighter liquid. In these cases an intermediate connection should be installed above the maximum interphase of two liquids and below the minimum level of the lighter liquid. This will permit the two levels to equalize and give proper readings on both (Fig. 6).

Pipe-stanchion mounting . . . The mountings of controllers and transmitters on pipe stanchions should be discouraged due to the fact that frequently vibrations will be picked up from the pipe above, particularly when reciprocating pumps are used in the process. This vibration can throw the reading off and, at times, two pumps can cause a set of harmonics that will start a cycle in the process due to vibration of the controllers.

More on mounting . . . Tower pressure controllers mounted above the pressure tap can give difficulty when the tap is located in the vapor section. The pressure lead line can fill and empty by condensation of the vapor. This can cause a regular or irregular error and thereby upset the process. A short loop seal in the line will correct the condition.

Torque-type level alarms . . . The use of troque-tube-type level alarms should be discouraged on compressor dry drums when high velocity exists on the inlet or outlet piping. High velocity can set up harmonics with the torque tube and cause the instrument to be useless. Certain types of torque-tube instruments are worse for this service than others.

Valve positioners . . . Pneumatic diaphragm control valves located a long distance from the controllers should be equipped with valve positioners. The long time lag required to fill the diaphragm can cause a definite lag between the control valve and instrument and set up a cycle in the process. This is especially true of instruments that have to operate with narrow throttling range such as pressure controllers where the valve is located on the gas leaving the tower.

Checking gage accuracy . . . If, in the installation of pressure gages and recorders, we install a pressure tap adjacent to the instrument, the accuracy of the gage can be checked by the installation of a master gage in a small fraction of the time that would otherwise be required. This, of course, only checks the accuracy at one point; however, this is always at the operating conditions and, therefore, is at the reading where accuracy is desired.

Thermometer test well . . . Standardize on thermometer test well length can save many man-hours searching for a thermometer to fit the well.

Pressure-gage snubbers . . . We have found pressure-gage snubbers of the nonadjustable type, preferably of the type not easily noticed, if properly sized will easily double gage life and thereby reduce man-hours required to recalibrate or replace the gage.

Prevent explosions . . . Instruments used in chlorine service should never be cleaned with alcohol as severe explosions can result when the instrument is put in service causing man-hours to be spent in the hospital rather than on the job.

Shop facilities . . . Proper engineering of shop facilities can save many man-hours of maintenance. The required facilities will vary from one plant to another and also with individual taste. Included in all shops should be an overhead trolley that can pick up material from a truck and move it to any heavy equipment work bench.

A pressure-gage test board in the shop should include a group of master gages, vacuum gages, and a manometer manifolded with proper valving to permit the instrument man to select the desired master gage range. Frequently, air can be used for checking the lower-range gages and speed up the testing thereby.

A tank on wheels for instrument sealing medium transportation from one area to another can save much needless work. A small pump should be located on the "sealing buggy." The shop should also contain a lead-covered sink where various pieces of equipment can be washed out. The lead covering permits weak acids to be dispersed without severe corrosion.

Card file . . . We have found that a well-kept card file system is a definite asset to the reduction of instrument maintenance. An instrument record card which shows that frequent parts replacements are necessary indicates severe service and calls for improving the conditions if at all possible. Failing this, the next step is change of application or instrument design.

Changing charts . . . Circular chart changing by the operators reduces maintenance men's time by several thousand man-hours per year.

"Cat cracker slide-valve wear can be reduced by (1) keeping port valve as small as possible, (2) keeping port shapes square or rectangular, and (3) making overclosure of valve on all four sides as great as possible."

PROGRESS REPORT:

Southwest Muldoon Believed Now Fully Developed

by Lloyd J. Ryman

Steinhauser sand has produced major portion of field's production.

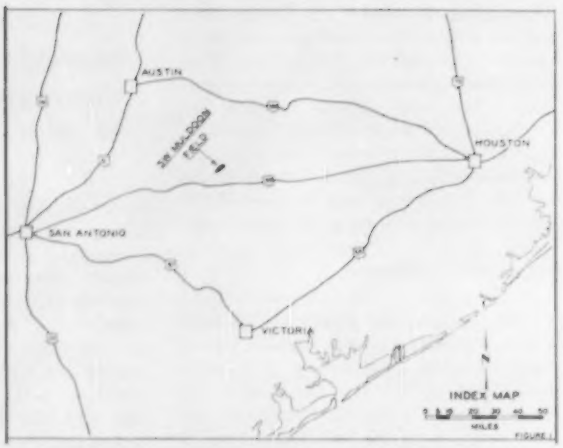


Fig. 1—Southwest Muldoon field is located approximately halfway between Houston and San Antonio.

SOUTHWEST MULDOON FIELD is typical of a cluster of small shallow oil fields which produce from a series of fault closures in western Fayette and northeastern Gonzales counties, Texas. It is located in Fayette County, a few miles north of Highway 90 about 120 miles west of Houston and 90 miles east of San Antonio (Fig. 1).

The topography is gently rolling, moderately wooded farm and pasture land with an average elevation of 400 ft. The surface is covered with a reddish sandy soil derived of the Yegua formation of the Claiborne group, and a dark gray clay of the Jackson group. This contact was used in early surface mapping and proved a fairly reliable marker.

Early exploration discouraging . . . It is difficult to ascertain when the first exploration for oil was conducted in this general area, but it is known that intensive surface work was conducted as early as 1928—probably as a result of the success of surface geology in finding Cretaceous production from fault closures in nearby Caldwell, Guadalupe, and Bastrop counties. In 1936 Renick[1] mentioned the Flatonia nose which feature is now the area of production.

The first drilling in the area was the Red Bank Oil Co. 1 Alfred Steinhauser drilled dry to 3,008 ft. in 1926. The location of this test is somewhat doubtful, but it seems to have been drilled just outside the present producing limits of the field. However, it reported only a small oil or gas show at 831 ft.

Author is geologist for Continental Oil Co., San Antonio. This paper was given at the fourth annual meeting of the Gulf Coast Association of Geological Societies in Houston, November 1954, and is presented with permission of the association.

In 1938 Continental Oil Co. mapped a surface anomaly in the area and followed the surface work with a few core holes. Combination of the two methods succeeded in determining presence of an up-to-the-southeast fault striking diagonally from the southwest corner of the James Parrott League northeast to the near northeast corner of the A. Weaver Survey.

Acreage was leased along the fault at a 50-cent per acre bonus with 50-cent rentals. In 1940 the Hynes 1 Kerr, 4,007-ft. dry hole, was drilled on a farmout from Continental in the southeastern portion of the Parrott Survey. Once again the productive limit of the field was just missed. The test encountered good oil shows in the drilling mud, but operators were unsuccessful in locating the shows with sidewall cores. Oddly enough, none of the presently producing zones were sidewall cored. This well provided the first electric log in the area to reach the present pay zones.

The Miller 1 Helmcamp and 1 Kerr were drilled northeast of the field in the J. M. Molino Survey in 1941, but neither encountered important shows.

These dry holes, although discouraging to the probability of a really large structure, were not considered to have condemned the prospect. And they did provide additional fault control as well as a better idea of the subsurface geologic section.

However, the curtailment of drilling during World War II and a lack of controlling acreage prevented Continental from drilling until 1950 when a farmout was obtained from Hamman Oil & Refining Co.

The discovery well was the Continental 1 Alfred Steinhauser drilled on this farmout and located in the western portion of the A. Weaver Survey. This well was drilled to a total depth of 2,326 ft. and completed July 7, 1950, for 66 bbl. per day on pump from an open-hole completion at 2,318-26 ft. in the Steinhauser sand. This well also was dangerously close to being another failure because the pay section drill-stem tested only oil-cut mud, and there was considerable doubt as to whether setting of pipe was justified.

Development drilling then continued at a fairly consistent rate; as of May 1954, there were 24 producing wells.

Stratigraphy

The geologic column of the Hynes 1 Kerr, deepest test in the field, includes Yegua to undifferentiated Wilcox of Eocene age. From nearby control, the Midway is estimated to be at a depth of 5,200 ft. No detailed study has been made of the stratigraphy of the area, but examination of Stenzel's work in Leon County,[2] personal communication with Renick regarding recent work in Caldwell and Bastrop counties, and electric log correlations have resulted in assigning formations and members as shown by Fig. 2, a composite log of the field.

The assignment of the pay sands is unfortunately the most questionable. Occasionally the top of the Cockrill sand section has been referred to as the top of the "Carrizo Wilcox." Also, the top of the Arnim sand has sometimes been designated as the top of the Carrizo. However, the writer is of the opinion that the Cockrill sands belong definitely to the Newby member of the Reklaw and that the Arnim sands also probably belong to the Newby. The Steinhauser sand then becomes the top member of the Carrizo.

This definition of the Reklaw-Carrizo contact is also supported by examination of core records of the field wells which consistently report glauconite, indicative of Reklaw marine deposition,

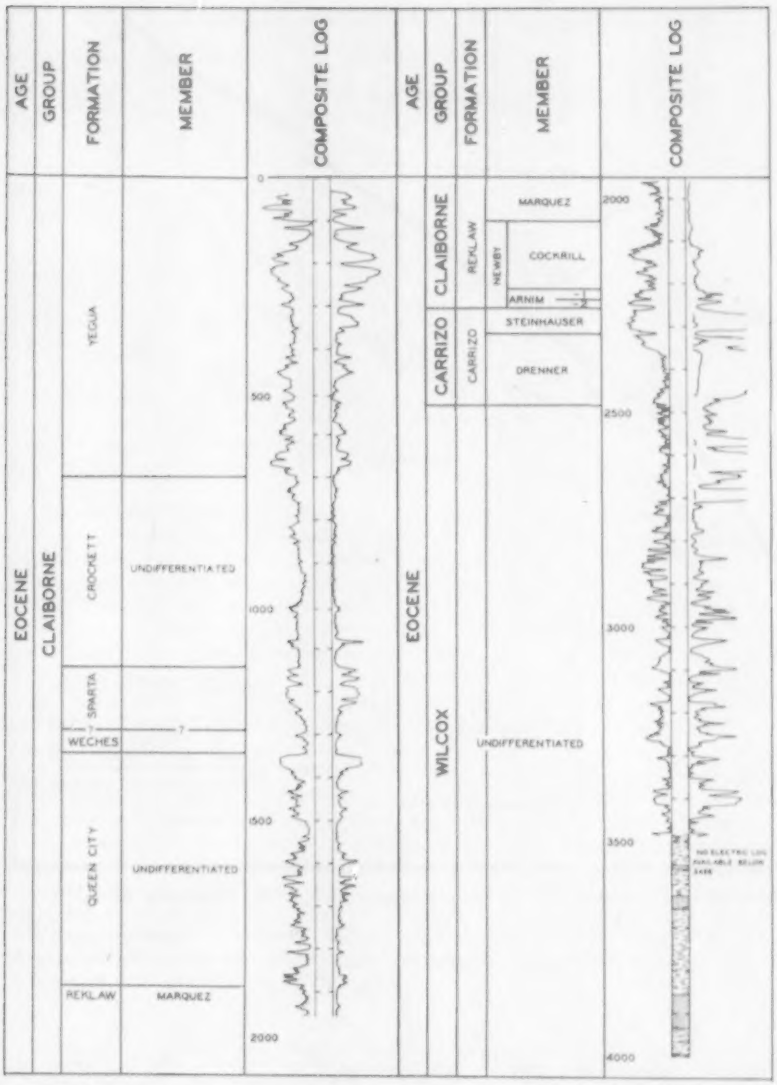


Fig. 2—Composite log of subsurface formations encountered in Southwest Muldoon field.

in the Arnim sands. The Steinhauser and Drenner core descriptions reveal a complete lack of glauconite, and the occasional occurrence of lignite mentioned is suggestive of Carrizo continental deposition.

Structure

The structure at Southwest Muldoon field consists basically of a faulted anticlinal nose, with the local fault possibly being a downdip en echelon segment of the Cistern-Paige-Tanglewood fault zone which traverses southeast regional dip approximating 200 ft. per mile. The fault has a dip of approximately 54° in Southwest Muldoon and strikes north 50° east. Displacement varies from 80 to 120 ft.

The fault plane is sometimes shattered to the extent that as many as four distinct 12 to 50-ft. fault cuts are picked in one well within an interval of 150 ft., although usually only one cut is present. The very good electric-log correlations prevailing above the pay section facilitate making locations very near the fault trace—a fortunate circumstance since the productive band has not exceeded 1,400 ft. in width.

The combination of the nosing and the faulting of the permeable pay sands up against impermeable Reklaw shale forms the primary structural trap. There is considerable evidence that additional influence is exerted by permeability barriers and local changes in strike of the fault trace.

Detailed structural mapping also reveals the closure to consist of a series of small undulations of the contours on the upside of the fault, rather than a single large closure. In most cases this makes for separate reservoirs, although some fluid levels seem uninterrupted from one closure to the next.

Producing Zones

Three separate sands produce in Southwest Muldoon. These reservoirs are designated locally as the Arnim 1, Steinhauser, and Drenner sands, and are encountered at depths ranging from 2,150 to 2,350 ft. The field has been divided by Continental into segments A and B to separate the two principal closures. In addition to these zones, the Arnim 2 sand will probably eventually produce a small amount of oil through workover operations.

The Arnim 1 sand is the uppermost of the producing horizons. It is often referred to locally as the first Wilcox sand, although as stated above it probably represents near-basal Reklaw. It is a fairly good mapping horizon and is rather persistently developed. In Southwest Muldoon field it is a soft, usually fine-grained to silty sand interbedded with numerous sandy shale and shale streaks ranging from less than an inch to 2 or 3 ft. in thickness.

As of May 1954, eight wells were producing from this member with average initial potentials ranging from 40 to 70 bbl. of oil per day. All of the production is from segment A where a gas cap overlies a 25 to 35-ft. oil column. Although profitable enough to develop, poor sand conditions and a thin oil column sandwiched between the gas cap and water preclude important production from this reservoir. In B segment, a 25-ft. column is separated from water by only 4 ft. of oil column.

The Steinhauser sand (Fig. 3) is separated by 4 to 7 ft. of shale from the overlying Arnim 2 and by 2 to 6 ft. of shale from the underlying Drenner. It is without question the most important producing zone. As of May 1954, there were 13 wells producing from this zone. Initial potentials ranged from 55 to 272 bbl. oil per day and averaged approximately 70 bbl. oil per day. All wells are on pump, although a few flowed initially.

Sand conditions are quite variable, with the best development found in the B segment where a minimum of 57 ft. of oil column is present with a maximum of 47 ft. of net oil sand found in any one well. In this segment the sand is friable, very fine to fine grained, and well sorted. Permeabilities sometimes exceed 5,000 md. but average about 790.

At the extreme northeastern flank of the structure and in the synclinal area which separates Southwest Muldoon from Muldoon field, the sand becomes shaly and possibly forms a permeability barrier which joins the fault to assist in forming the trap. Southwestward across segment A, permeabilities

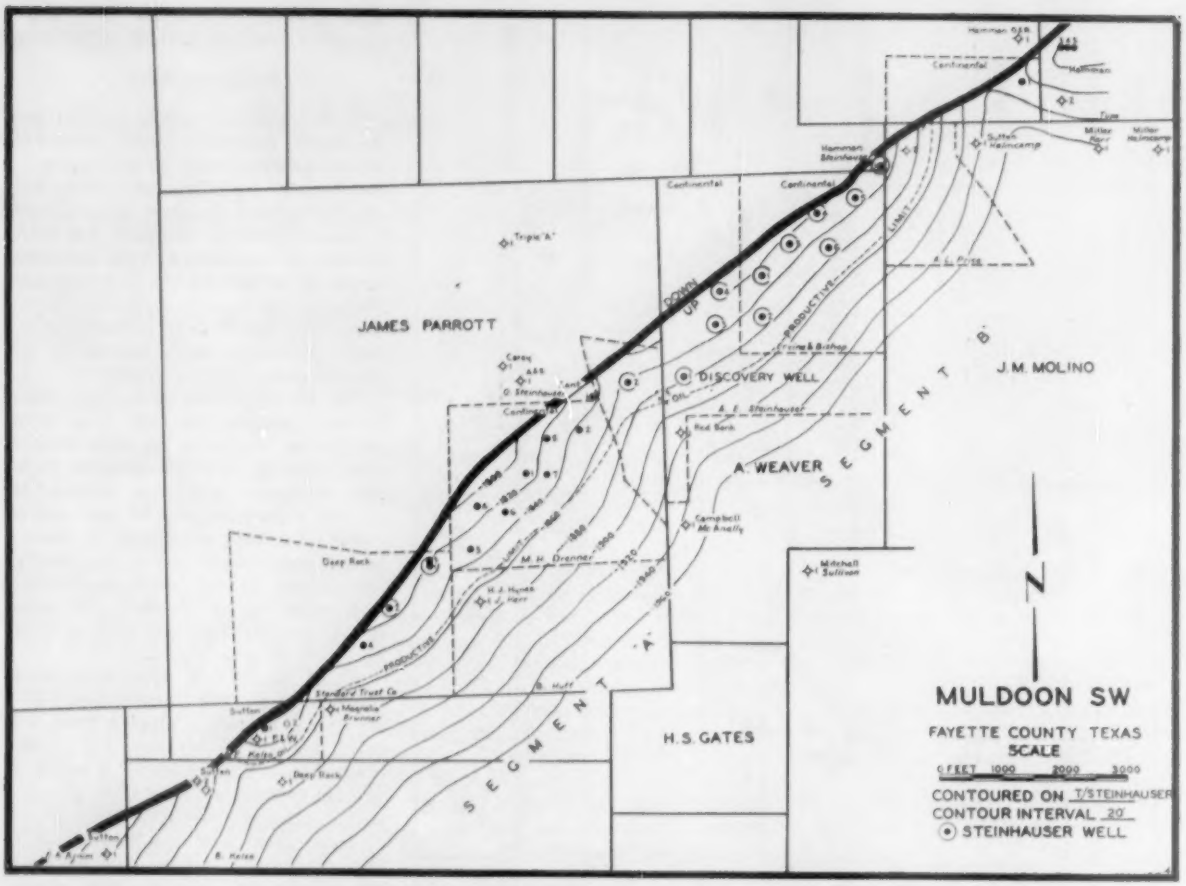


Fig. 3—Structure map of Southwest Muldoon field, contoured on the main producing horizon, the Steinhauser sand.

again become quite poor and numerous shale breaks are present on the Continental Drenner lease where open-hole drill-stem tests produce only oil-cut mud. Future reworks will possibly establish production here with the aid of formation fracturing.

On the Deep Rock and Sutton leases farther southwest, the Steinhauser is divided into separate members by definite shale breaks, with only the lower portion apparently permeable enough to produce. Although differences in oil-water contacts from southwest to northeast are noted in this area, they are believed to be caused by permeability variations rather than an inclined water table. This conclusion is based partially on the stable oil-water contact of between 1,794-97 ft. subsea throughout the B segment where continuous permeability exists.

The Drenner sand produces only at the crest of the structure from three wells on the Continental M. H. Drenner lease where a maximum oil column of 25 ft. is present. This sand is typically a very clean, fine-grained, well-sorted sand which is usually unconsolidated and highly permeable. Initial potentials of wells in this reservoir were 50-70 bbl. of oil daily on pump. The 1 Drenner flowed initially but soon became a pumper.

The Drenner is separated from the overlying Steinhauser in this segment A by virture of different fluid levels and

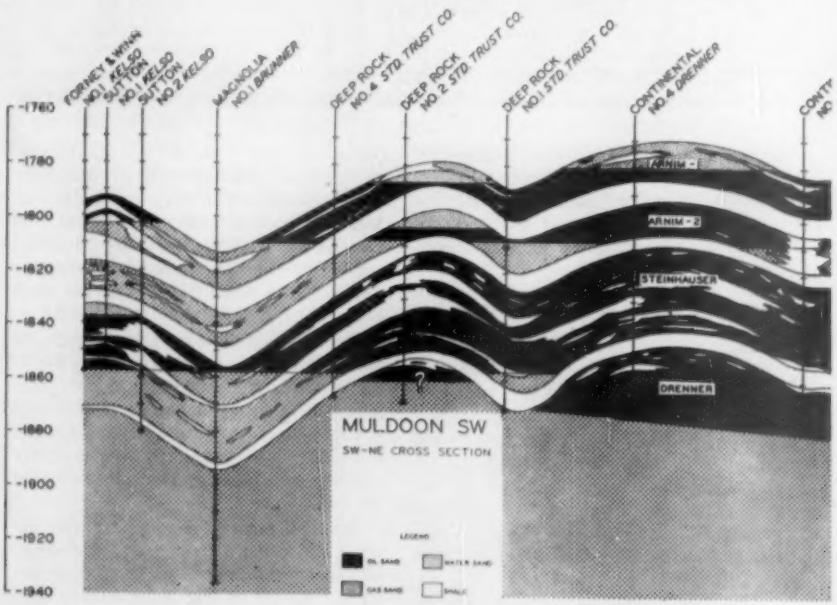


Fig. 4—Southwest-northeast cross-section displays fluid levels

TABLE 1—AVERAGE RESERVOIR DATA FOR SEGMENTS A AND B

Reservoir—	Eff. sd. (ft.)	Perm. (md.)	Por. (%)	Interstitial water sat. (%)	Oil grav.
Segment A					
Arnim 1	7	813	37.7	33	21°
Arnim 2	6	293	36.3		21°
Steinhauser	11	204	34.3	32	21°
Drenner	12 oil	1,753	36.9	33	21°
Segment B					
Arnim 1	5.5	1,000	40.0		21°
Arnim 2	5.5	185	37.6		21°
Steinhauser	30	790	38.7	32	21°
Drenner					

a distinct shale break. To the northeast, however, in segment B, the two members apparently merge into one sand body and represent a common reservoir.

Uniquely, this reservoir may have an inclined oil-water interface with the contact varying from 1,871 ft. subsea at the southwest end of the reservoir to 1,882 ft. subsea at the northeast end. This change occurs in a short distance and approximates a 5° northeast tilt.

Lack of downdip control does not permit postulation as to whether the tilt is also southeastward in the direction of regional dip. This oil column is at the top of approximately 150 ft. of highly permeable fresh - water - bearing sand. So it is easily theorized that sufficient movement of water exists to incline the water table, while fluid levels in other, less-permeable reservoirs of the same structure have stabilized.

A cross-sectional reservoir study demonstrating fluid levels and sand conditions is shown by Fig. 4. Table 1 gives average reservoir data for segments A and B.

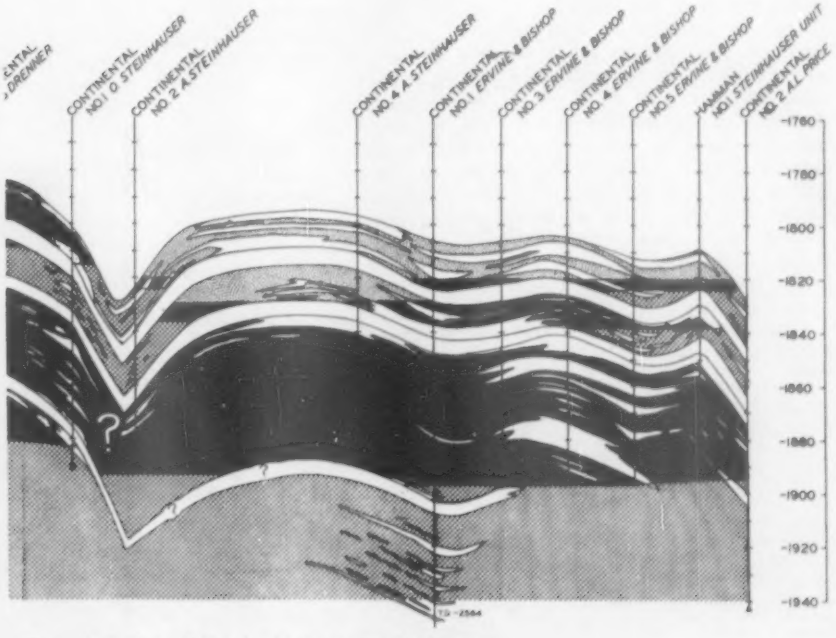
Operating Practices

Standard operating procedure calls for wire-line coring and open-hole drill-stem testing of all potential producing horizons. The fresh - formation - water content of the sands renders electric-log fluid determinations impractical thus far. Core analysis is a fairly reliable tool although porosity determinations are probably too high due to the unconsolidated and friable nature of the sands.

This condition also usually prevents running of permeability tests at true reservoir conditions, and permeability to air values are generally too optimistic for the shalier sands. Permeability to air of less than 100 md. is often too low to produce commercially. Barren streaks within the oil column are not uncommon. Therefore, even on inside locations, open-hole drill-stem tests to prove production are considered desirable before setting pipe. Core recovery is good, averaging over 80 per cent with an experienced drilling crew. It is interesting to note that solvent cuts of saturated oil sand in this area usually result in 12 to 20 per cent oil by volume.

Continental has utilized two basic methods of completion. One method is to set production pipe through the producing zone and, after drilling out, replace the drilling mud with field crude and perforate. After washing by the perforations to produce a cavity behind pipe, the formation is gravel packed through perforations.

The second and most successful method is to set the production pipe at the top of the producing sand. After drilling out, the mud is replaced with field crude and the open hole underreamed and gravel packed. This open-hole method of completion, however, necessitates total depth of the well safely above the oil-water contact in the expected producing sand. So it precludes evaluating any lower sands. Attempts to set cement plugs to seal off water from lower sands and then complete in open hole have not been successful.



and erratic sand conditions in the Southwest Muldoon area.

Production and Development

The field is now believed fully developed with the possible exception of one or two inside locations. As stated previously, there are 24 producing wells of which 8 produce from the Arnim 1, 13 from the Steinhauser, and 3 from the Drenner sand.

Through March 1954, cumulative production was 450,594 bbl. Although cumulative production by reservoir is not available for the entire field, Continental's total cumulative production for this period of 393,520 bbl. is broken down as follows: Arnim 1, 51,254 bbl.; Steinhauser, 273,422 bbl.; and Drenner, 68,844 bbl.

Field rules have been established which call for 20-acre proration units with 660-ft. spacing between wells.

Acknowledgment

The writer wishes to express appreciation to Continental Oil Co. for permission to publish this paper, and to Deep Rock Oil Corp. and Sutton Drilling Co. for permission to use electrical logs of their wells.

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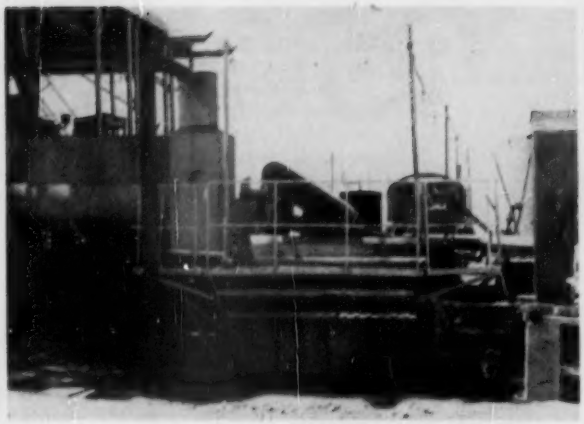
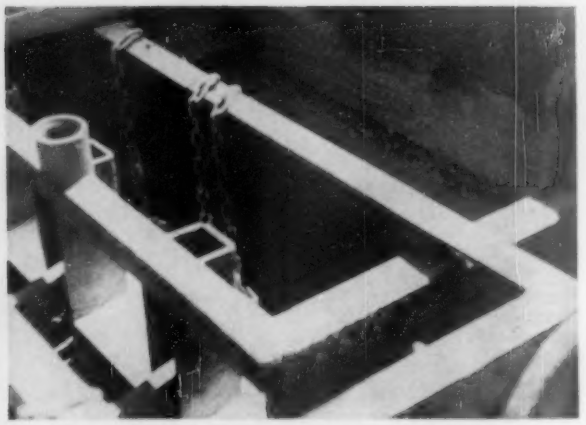


The air-mud separator first installed on the flow line. It was necessary to increase the size of the vent line shown here. The flow line is slanted to prevent cuttings from accumulating.



Second compartment of the air-mud separator. Shale shaker is at left foreground. Mud must travel under seal at right background and up over shaker. Operating mud level is shown by black line.

A promising new tool

Phillips Tests Air-Mud Drilling

by Roy A. Bobo, George S. Ormsby, and R. S. Hoch

What Is Future Application of Air-Mud Drilling?

Wide-scale application of aerated-mud drilling in normal and subnormal pressure areas of the United States will depend on development of material for sealing off or impairing the productivity of moderate to high-pressure water zones with techniques known to the industry. The outlook for accomplishing this economically is bright.

Further experience and information with greater air volumes are necessary for full evaluation of this method. Should aerated-mud drilling prove successful, the present concept of rig design and operation will be altered. Also more alertness and knowledge will be demanded of rig personnel.

Aeration of the mud can be developed to permit drilling with a fluid ranging from nearly 100 per cent air to 100 per cent mud in a matter of minutes. This will represent the ultimate in drilling-mud flexibility to meet subsurface conditions. The inherent advantages of this method of drilling were cited in the January 24 Journal. Since bottom-hole pressures with aeration can be made to approach those possible in air drilling, future prospects appear theoretically better for aeration than for air.

Part 2

FIELD tests by Phillips Petroleum Co. as reported in the Journal of January 24, show that, properly applied, the aerated-mud drilling technique can appreciably increase penetration rates and alleviate loss of circulation. Presented here is a description of the equipment used, techniques necessary, and fundamental theory of the method.

The introduction of both air and mud into the drilling string requires separate equipment for each phase. The mud phase remains identical to that employed in conventional mud drilling. The air phase, in the tests reported here, was delivered by a three-stage, 220-hp., skid-mounted compressor connected indirectly to the standpipe. A diagram of the arrangement is shown in Fig. 1.

The flow of air from the compressor to the standpipe is controlled on the rig floor by opening or closing a stop valve on the air line. When the valve is closed, the compressor continues to supply air until the discharge pressure approaches the setting on a positioning-type controller, at which time the controls automatically slow the compressor down and lift the compressor cylinder valves, completely unloading the machine.

Authors are with drilling engineering division, production department, Phillips Petroleum Co., Houston.

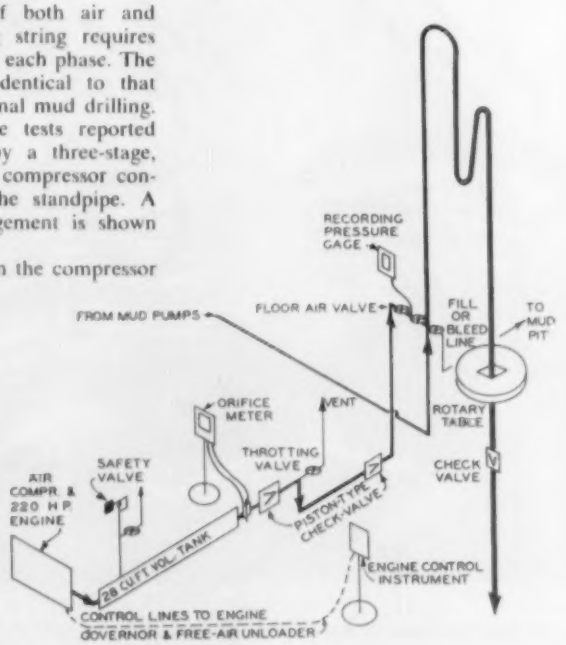
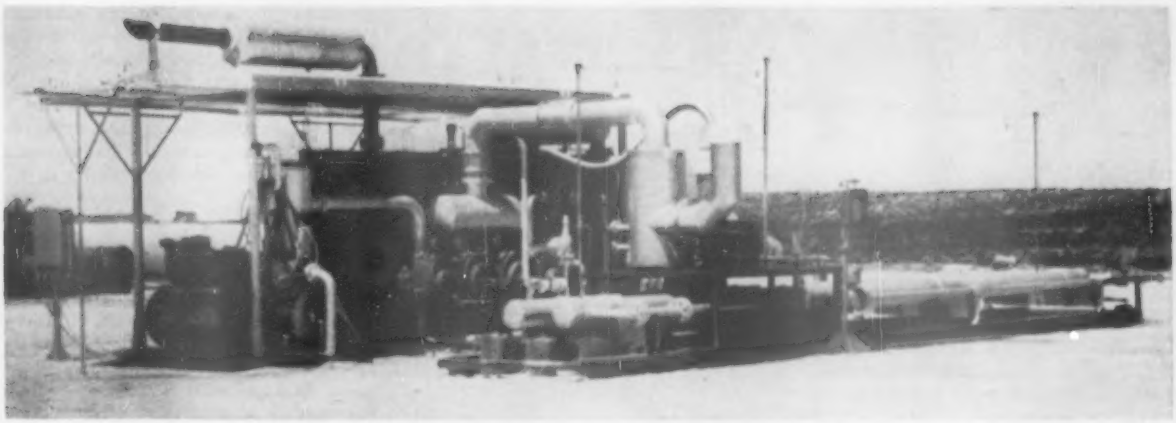


Fig. 1—Schematic diagram of the aerated-system used on Phillips 1 Odom C. On this test, air entered mud stream at the standpipe; in earlier tests it was injected between two slush pumps in series.



The compressor plant that supplied air for the standpipe aeration tests. Low-stage compressor cylinders are fitted with automatic clearance pockets to keep the load on the machine uniform.

Volume tanks are placed in the line between the compressor discharge and the standpipe. These allow instrumentation time to slow the compressor down and unload its cylinders before the discharge pressure can reach the danger limit when the floor valve is closed.

Compressors . . . The two low-stage compressor cylinders are each supplied with two automatic clearance pockets. Their function is to keep the machine operating near full-load conditions at all pressures within its rating. These pockets, each controlled by snap-acting regulators which in turn are actuated by positioners, are all closed at low pressure and open individually at predetermined positioner pressure settings. Although the clearance pockets permit maximum utilization of horsepower, they can also result in objectionable undulation of compressor discharge volume and standpipe pressure. This occurs when standpipe pressure approximately coincides with a clearance pocket setting, and raises some question as to the advisability of using automatic clearance pockets in this application.

The machine is also equipped with automatic scrubber drains, automatic radiator-water-temperature control, interstage air cooling and with low oil pressure, high-water temperature, high-scrubber water level, and engine overspeed automatic shutdown devices. A spring-loaded safety valve as well as air blow-down and hand-operated drain valves are provided on the air volume tanks. A flange-type meter run with a 24-hour recording orifice meter is used to measure air discharge.

Hydraulic System

Two piston-type check valves are placed in the air line to the standpipe to prevent the backflow of drilling mud into the meter run and volume tanks. The check valve nearest the standpipe is field modified for quick closing while the one nearest the air tanks is of the dampened type.

A special check valve has been developed that is placed one joint below the kelly on each trip out of the hole (see Fig. 2). It is designed and constructed to permit running wire-line string shots through it in case of stuck pipe. The purpose of the valve is to contain the compressed fluid in the drill pipe and prevent backflow during connections.

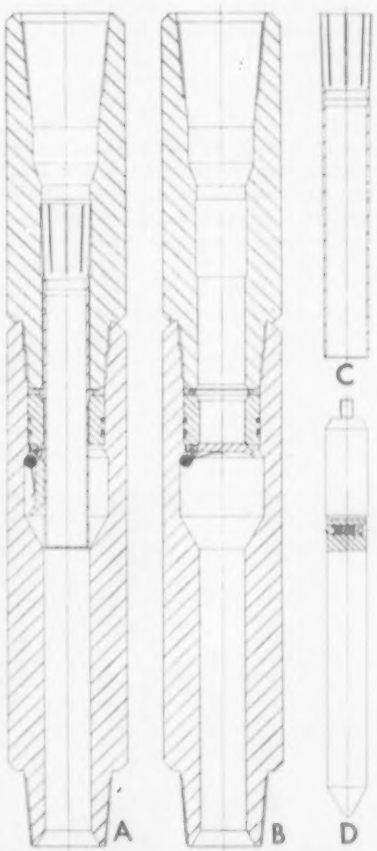


Fig. 2—Flapper-type back-pressure valve, 4½-in. full hole, with the valve-opening sleeve in place at A, and without the sleeve at B. C is the sleeve, and D is the setting tool for it.

Bits with much smaller than standard "jet nozzle" openings are necessary for the most effective aerated-mud drilling, due to the relatively lower mud rates. For instance, with the minimum mud rates in effect during the three tests reported here, three ⅜-in. nozzles were found to be best in the 11-in. bit and either two ⅞ or three ¼-in. in the 7⅞-in. bits. With the 7⅞-in. bits it was found quite satisfactory to pump a small ball down the drill string to plug one of three ⅞-in. nozzles after aeration was established.

To prevent mud splashing on the rig floor and loss to the cellar, and for safety while drilling formations in which gas may be present, a rotating packoff head is required. A standard type has been used, but maintenance of the rubber sealing elements has been somewhat of a problem. The annular pressure against the head is ordinarily less than 1 psi., and should never exceed 10 psi. It should be possible to design a better and cheaper head than is now available to fit this specific condition.

Mud-flow line . . . An oversize mud-flow line is essential. A 20-in. flow line was used on these tests, which was sufficiently large to permit separation of the air and mud in the line and to reduce the velocity of the air to less than 350 ft. per minute. In addition, baffles slanted down at a 45° angle were used to direct the mud downward into the mud box during surges. If some such arrangement were not used the velocity of the mud would at times carry it across the shaker to the ground.

The flow line must be sloped to prevent cuttings from collecting. Preferably, the pitch should be constantly

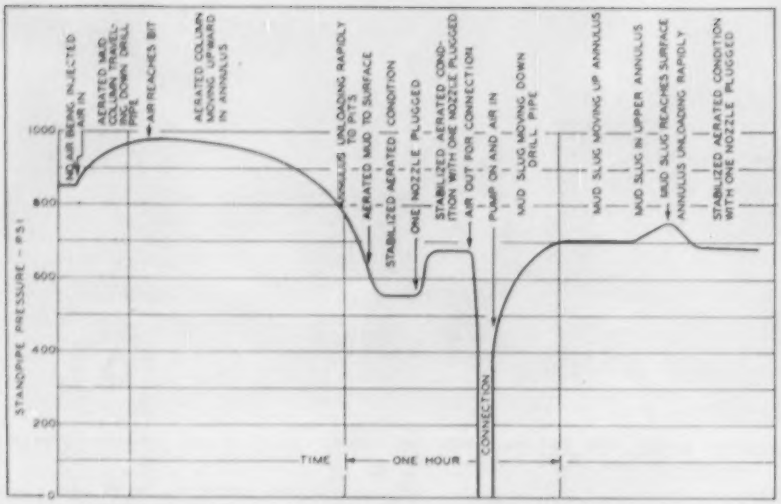


Fig. 3—An idealized composite log of standpipe pressure when drilling with aerated mud at 8,500 ft. in a 7⅞-in. hole and with three 5/16-in. nozzles in the bit.

downward to the mud box, but satisfactory results have been obtained with the line sloping steeply upward to a point outside the rotary beams, from whence it can be sloped downward to the mud box. Level sections and valleys must be avoided.

As is true with air and gas drilling, safety in aerated-mud drilling requires that all gas that might be produced be transported a safe distance from the well. This can be accomplished by dividing the mud box into two compartments separated by a liquid seal. The mud line discharges into the first compartment, which is closed except for a vent line connected to the top and a mud-sealed outlet at the bottom. The second compartment is open and discharges over the shale shaker. An accompanying photo illustrates one version of the chamber, but the design can be greatly improved based on experience.

Storage necessary . . . The air introduced into the mud stream reduces the bottom-hole hydrostatic pressure by displacing part of the mud in the hole. For example, to reduce the effective annular density from 10-lb. per gal. mud to an average of 5-lb. per gal. aerated-mud mixture requires that more than half the original mud volume be displaced by air. Storage space must be available for this displaced volume. A properly arranged reserve pit provided with a return pump can be made to serve quite satisfactorily. Lease stock tanks are often available and can be used.

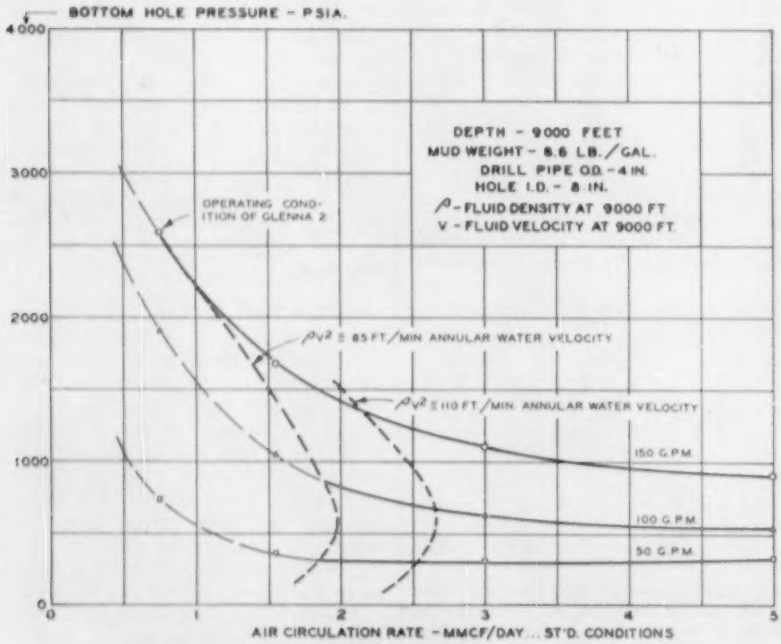


Fig. 4—Theoretical bottom-hole pressure with various air-mud ratios.

Technique of Drilling With Aerated Mud

Starting air into the mud . . . The mud-circulating rate should first be adjusted to deliver the minimum mud rate necessary to clean the hole, and the automatic pressure control is set well above the mud-circulating pressure. The air valve is then opened and the air and standpipe pressures equalize as air enters the standpipe. As the aerated-mud column travels down the drill pipe, an increase in standpipe pressure occurs due to the unbalanced density between the mixture in the drill pipe and the mud in the annulus (see Fig. 3). After the aerated column reaches the bit and starts up the annulus, the standpipe pressure begins to decrease—the effect becoming rapid as the aerated column approaches the surface.

The approach of the aerated mud to the surface is preceded by a tremendous surge of mud as the air expands. After this surge passes, the standpipe pressure remains fairly constant, subject only to mud-pump variations, making connections, and compressor clearance pocket changes. Slippage can cause noticeable variations at extremely low total rates of flow.

The weight indicator should be checked and readjusted after the aerated mud reaches the surface, as the hook weight will have increased considerably during aeration of the annulus. If it is desired to drill using lower mud-circulating rates with air than would be possible without air, the mud volume should be reduced only after the air reaches the surface.

Making connections . . . Before a connection is made, the air must be shut off and the mud pumps run long enough to displace all the aerated mud from above the drill string check valve. This ordinarily requires from 20 seconds to 2 minutes, depending upon the depth of the check valve and the circulating rate. The fill line is then opened to the casing to bleed off any pressure that might be trapped.

As the kelly is broken, crew members should watch carefully to make sure that all pressure is bled off. The connection is then made in a routine manner and the air valve is opened as soon as the mud pump is started. Routine connections on this job required between 4 and 5 minutes.

Immediately after a connection, the standpipe pressure is low. The longer the mud slug at the connection and the larger the bit nozzles, the lower the standpipe pressure will be. With standard bit nozzles, there may be a vacuum on the standpipe with the mud pump running, until the air valve is opened. As the mud slug travels up the annulus the pressure increases to a maximum higher than it was before the connection was made. This high occurs just as the mud slug approaches the flow line, after which the standpipe pressure settles back to its previous levels.

Mud pit levels . . . Just as in conventional drilling, the mud pit levels should be watched for indications of gain from or loss to the formation. Loss to any but the worst type of zone will not occur during aeration; but gas, oil or water may be gained from formations open to the hole. The mud rate can be varied for hydrostatic control if necessary.

Making trips . . . Before a trip is made the aerated mud should be displaced from the hole for several reasons:

1. If this is not done, the air tends to head and continue to blow mud from the hole while the pipe is being pulled. This effect can be quite severe.
2. Good hole-deviation readings are difficult to obtain unless the fluid columns are equalized. Apparently the fluid movement vibrates the instrument, causing erratic readings.
3. The competency of the open formations to support a column of mud can be checked.
4. An opportunity to mud off any low volume water formations is afforded.
5. Pit volume is reduced sufficiently to permit thoroughly cleaning all pits with a minimum mud loss.

If lost circulation is serious, it may not be feasible to completely fill the hole before a trip.

Surge from aerated mud was controlled by slanted baffles in the end of the flow line.

Foaming . . . In some areas, foaming occurs spasmodically whether or not air is injected into the mud. Caused principally by reaction of the mud with the formation being penetrated, its severity is dependent upon the properties of the mud itself and how the mud is handled.

Maintaining extremely low viscosity and low solids content of the mud is of great help. Regular and thorough cleaning of the pits is a necessity. Gunning of the pits was found to be harmful, as it prevents the settling of fine solids and carries air under the surface, creating more foam. On the other hand, a fine, hard, water spray is very effective in knocking down foam both in the pits and at the shaker. Forcing the mud to underflow through submerged equalizers from one pit to the next confines the foam to the shaker pit, which is a decided advantage.

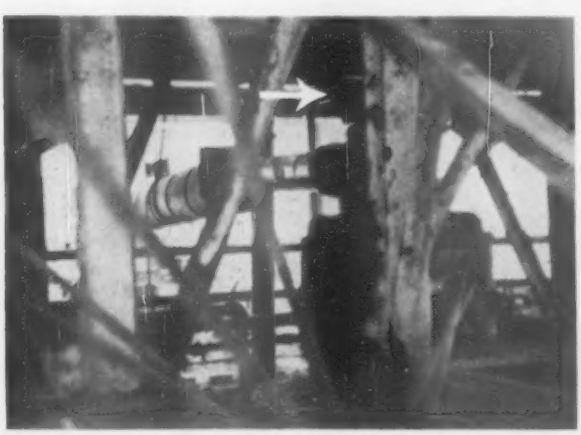
Aeration Drilling Theory

The first section of this article shows that penetration rate increases at an accelerated pace with decrease in bottom-hole drilling pressure. For this reason, the benefits derived by Phillips with limited air capacity, though significant, theoretically do not approach those which are possible with greater air volumes.

For the purpose of outlining future requirements, the following will concern the theoretical relationship among the following factors: mud and air circulation rates; hole depth; bottom-hole pressure; hole and drill pipe size; and mud weight.

A formula derived by Poettmann[6] for gas lift work was employed as a guide to the density reduction being obtained in early field trials, neglecting frictional and slippage effects.

The following equation derived by



To prevent mud from splashing off the rig floor and for safety, a rotating packoff head is used.

Air-mud separation chamber, flow line, vent line, and shale shaker in place for aerated-mud tests.

Woods with Hughes Tool Co. was used to develop Fig. 4, to which reference will be made throughout this discussion:

Formula:

$$X = \frac{(P - P_o)}{A + C} + \frac{B(A - C)}{2(A + C)^2} \log_e \left[\frac{(A + C)P^2 + 2CBP + CB^2}{(A + C)P_o^2 + 2CBP_o + CB^2} \right] - \frac{2B(AC)^{1/2}}{(A + C)^2} \left[\tan^{-1} \frac{(A + C)P + CB}{B(AC)^{1/2}} - \tan^{-1} \frac{(A + C)P_o + CB}{B(AC)^{1/2}} \right]$$

Nomenclature:

$A = 0.00708\ [(Q_a/Q_m)\ \rho_a + \rho_m]$

$B = 15\ [(Q_a/Q_m) + 0.02]$

$$C = \frac{0.00063\ Q_m^2\ [(Q_a/Q_m)\ \rho_a + \rho_m]}{(D_2 - D)\ (D_2^2 - D^2)^2}$$

Q_a = cu. ft. of free air per minute

Q_m = cu. ft. of mud per minute

ρ_a = pounds per cu. ft. of free air

ρ_m = pounds per cu. ft. of mud

D_2 = hole diameter, in.

D = drill pipe o.d., in.

X = feet of depth

P = bottom-hole pressure at (X), psia.

P_o = pressure at the surface at the flow line entry, psia.

In field operations, the reduction in bottom-hole pressure can be approximated by observing the rise in pit level volume after aerated drilling becomes stabilized. The theoretical results of Woods' equation approach those obtained on the 2 Glenna test.

Woods' equation considers solubility of air and includes a friction factor. Although a constant value for the friction factor was used in the equation, it is known that it varies with the rotary speed, hole and pipe dimensions, and mud-air ratios. In spite of these variations, it is felt that Fig. 4 is sufficiently accurate for estimation of requirements under the stated conditions.

Superimposed upon the pressure-volume curves of Fig. 4 are lines of constant ρV^2, corresponding to two different annular velocities, following the theoretical consideration that cutting carrying capacity is a function of the product of fluid density and the square of the velocity.[7] The lower rate of 85 ft. per minute represents the average annular fluid velocity in the lower part of the hole on the 2 Glenna. The 110-ft. per minute rate should assure safe cutting removal for wide variations in mud quality and hole size.

The following conclusions may be drawn from Fig. 4.

1. The minimum compressor capacity to obtain low bottom-hole pressures at 9,000 ft. in 8-in. holes would be 2,000,000 cu. ft. per day.

2. At some low bottom-hole pressure, further increase in air rate will increase the bottom-hole pressure.

3. The air rate must be increased as the mud rate is decreased in order to maintain a safe velocity; however, at some lower mud rate, the air volume can be decreased along with further reduction in mud rate without impairing the ability of the fluid to remove the cuttings.

General acknowledgment in air drilling is that formations may be drilled either "dry" or "wet," but that they cannot be drilled "damp." Only experience will show where this latter condition exists in aerated-mud drilling.

The air introduced into the system by the compressor, unlike the mud, contains energy due to its compressed state. During expansion this energy is expended in two ways: First, it must overcome the frictional and slippage losses in addition to those that would be incurred by the mud alone; and second, it assists in lifting the mud and cuttings from the bottom of the hole to the surface. This latter function reduces the work that is performed by the mud pumps.

This apportionment of compressor horsepower can be made without difficulty. First, the standpipe pressure is read while circulating only mud at the same rate that is to be maintained with air. Then air is introduced, and after conditions are stabilized at the same mud rate the new standpipe circulating pressure is recorded and the air volume rate is calculated. From the compressor manufacturer's curves, the compression horsepower is easily determined. Pertinent horsepower comparisons can then be made as follows:

1. Mud pump horsepower output without air $= \dfrac{P_c\ (\text{g.p.m.})}{1{,}714}$.

2. Mud pump horsepower output with air $= \dfrac{P_{c1}\ (\text{g.p.m.})}{1{,}714}$.

3. Compressor horsepower output (manufacturer's curves).

4. Extra total horsepower requirement (added friction and slippage losses) due to air injection = (3) + (2) — (1).

5. Compressor horsepower output utilized in reducing mud pump horsepower = (3) — (4) = (1) — (2) = g.p.m. $(P_c - P_{c1})/1{,}714$.

6. Efficacy = per cent compressor horsepower utilized in reducing mud pump horsepower = (5) (100 per cent)/3

$$= \frac{(1) - (2)}{(3)} \times 100 \text{ per cent}$$

$$= \frac{\text{g.p.m.}\ (P_c - P_{c1})}{1{,}714 \times (3)} \times 100 \text{ per cent}$$

Where:

P_c = standpipe circulating pressure before air injection.

P_{c1} = standpipe circulating pressure after air stabilization.

g.p.m. = mud circulating rate (must be the same before and after air injection for valid checks).

If preferred, a measure of system air efficiency may be obtained by substituting the air horsepower that is expended on expansion of the delivered air volume from standpipe pressure to atmospheric pressure for (3) in the above formula. In this case, assumption of isothermal expansion would be a good approximation.

Acknowledgment

The authors express their appreciation to Phillips Petroleum Co. for permission to publish this article. Acknowledgment is also made to Phillips West Texas drilling and production personnel for their able assistance and cooperation in carrying out this work, and to the company's research and engineering departments for assistance on the corrosion phase of the program.

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A MILE OF CORES. Ohio Oil Co. geologists inspect a part of more than 5,100 ft. of cores taken from the deep test.

What Ohio Oil Learned From World's Deepest Well

THE world's deepest well—a dry hole—has been abandoned by Ohio Oil Co. The well was drilled to 21,482 ft. to test unexplored formations below productive sands in Paloma field, 25 miles southwest of Bakersfield, Calif.

Cost . . . Approximately 2¼ million dollars have been spent in the venture since the well started drilling on October 23, 1951. Ohio Oil will bear the brunt of the cost, about $1,900,000. The remaining cost is shared by The Texas Co., Western Gulf, Lloyd Corp., Hancock Oil Co., General Petroleum Corp., and Pacific Western Oil Co. through dry-hole contributions. These companies, as well as Ohio Oil, hold acreage in the Paloma area.

The deep test was scheduled to drill to the Point of Rocks sand of Eocene age, expected at around 20,500 ft., as well as the Oceanic in the Miocene. These sands are prolific oil-producing horizons in other Kern County, California, fields. But the test was still drilling in the Lower Miocene beds without reaching objective sands when core barrel stuck at 21,482 ft. on October 30, 1953.

Then followed a prolonged fishing job to recover the drill pipe and core barrel. Five months later crews had recovered the drill pipe to 17,237 ft. Feeling that further fishing was impractical, the company then ran 5½-in.-diameter steel pipe into the hole to case it to 17,222 ft. Since last May Ohio Oil has worked progressively up the hole: a gun perforating, then testing possible producing sands indicated by electric logs. Five intervals of sand were tested between 14,050 and 17,135 ft. and three intervals between 11,520 and 13,260 ft. None showed commercial production.

Ohio Oil's test was drilled on acreage leased from Kern County Land Co. in the south-central portion of 17-year-old Paloma field. Within 7,500 acres, 115 wells at Paloma are producing a total of 7,000 bbl. of oil daily from sands between 10,000 and 11,950 ft.

The drilling put to a real test modern drilling equipment. Earth temperatures recorded below 20,000 ft. were upwards of 330° F. This called for a special oil-base drilling fluid to carry the well down after it passed the 11,000-ft. depth. The conventional water-clay-base drilling fluids would have balled up and hardened with the intense deep-earth temperatures.

At 10,947 ft. drilling crews landed and cemented the heaviest string of pipe ever run in California: 279 joints of steel casing, 9⅝ in. in diameter, weighing more than one-half million pounds. Below the bottom of this pipe drilling progress slowed abruptly as the bit ground into marble-hard compacted shales and sandstones.

From 10,947 ft. to the total depth the well was drilled with diamond-faced bits and core heads. Cost of diamond bits averaged $6,000 and of diamond core heads $5,500, with salvage values averaging 55 to 60 per cent.

Earthquake . . . Located only 14 miles northwest of the epicenter of the Bakersfield earthquake of July 21, 1952, the drilling crew, equipment, and hole went through the quake unscathed. On the earthquake day, the diamond bit was on bottom making hole at 14,310 ft. when the tremors started at 4:52 a.m. Driller Fred Ryan held on to the brake at the draw works when the tremors started. Top of the 194-ft. derrick swayed in an arc of 15 to 20 ft. The steel drilling cable supporting the 110-ton load of block, hook, and drill pipe in the hole slapped against the sides of the derrick. Ryan held firm to the brake through the first tremor, then chained the brake down to the derrick floor.

Records . . . The Paloma record depth well was 961 ft. deeper than previous record holder, Superior Oil Co.'s Pacific Creek exploratory well in Sublette County, Wyoming, which reached a total depth of 20,521 ft. on June 18, 1949. The Pacific Creek well was later abandoned after a series of formation tests.

The world's deepest producing well is located only 5½ miles north of Paloma. This well is Richfield Oil Co.'s CLA-67-29 in North Coles Levee field, Kern County, California. The Richfield well was completed on December 4, 1953, in a sand in the Eocene between 17,497 and 17,892 ft. The well made 58 bbl. of oil and 1,785,000 cu. ft. of gas initial daily production.

Fundamentals of Gas Lift—9

Spacing Pressure-Loaded Gas-Lift Values

. . . First determine operating flowing gradient

by C. V. Kirkpatrick

PROPER spacing of gas-lift valves is nothing more than arriving at a correct force and pressure balance for the expected set of conditions. In arriving at the spacing formula, the operating flowing gradient is a highly significant term. Consequently, a principle effort should be correct determination of this gradient.

Fundamentally, valve spacing falls into two categories: for differential valves, and for pressure-loaded valves. Only spacing of pressure-loaded valves will be considered here.

The position of the first valve depends upon casing pressure available at the surface, static fluid gradient, and static fluid level of the well. If the static fluid level is near the surface, position of the first valve can be determined as set out below and in Fig. 1. With the tubing and casing pressures both operating over the same effective areas, the force balance on a pressure-loaded valve is:

$$(L_1 G_s) A_V + D_V A_V = P_V A_V$$

Where:

L_1 = distance to the first valve, ft.

P_V = casing pressure opposite the valve, and usually taken as equal P_c or the casing pressure at the surface

G_s = static pressure gradient, psi. per foot

D_V = differential pressure in the valve, and in a pressure-operated valve is negligible

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So the equation becomes:

$$L_1 = P_c / G_s \qquad (1)$$

Fluid level down the hole . . . For spacing the first valve when the static fluid level is down the hole, Fig. 2 shows:

$$L_1 = L_s + X$$

Where:

L_s = distance to the static fluid level, ft.

X = submergence of the valve below the static fluid level, ft.

But, an equation may be made so that:

$$XA_A = YA_T \text{ or } Y = XA_A / A_T$$

Where:

A_A = cross-sectional area of the annulus

A_T = cross-sectional area of the tubing

Y = the linear distance in the tubing that corresponds to the same volume as the linear distance X in the casing

Now referring to Fig. 2, a force balance on the first valve would be:

$$A_V (X + Y) G_s = P_V A_V$$

or:

$$X (1 + A_A / A_T) G_s = P_V$$

Then substituting $L_1 - L_s$ for X, and P_c for P_V:

$$L_1 = L_s + \frac{P_c}{(1 + A_A / A_T) G_s} \qquad (2)$$

For second valve . . . For the spacing of pressure-loaded valves other than the first, reference is made to Fig. 3. For valve No. 2, a pressure balance would be:

$$P_{V2} = (G_F)(L_1) + (G_{SF})(L_2) + P_s$$

and

$$L_2 = \frac{P_{V2} - (G_F)(L_1) - P_s}{G_{SF}}$$

Where:

L_2 = depth of second valve below first valve

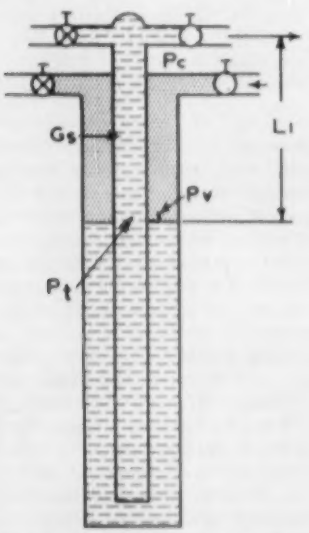


FIG. 1—Static fluid level in this case is at or near the surface.

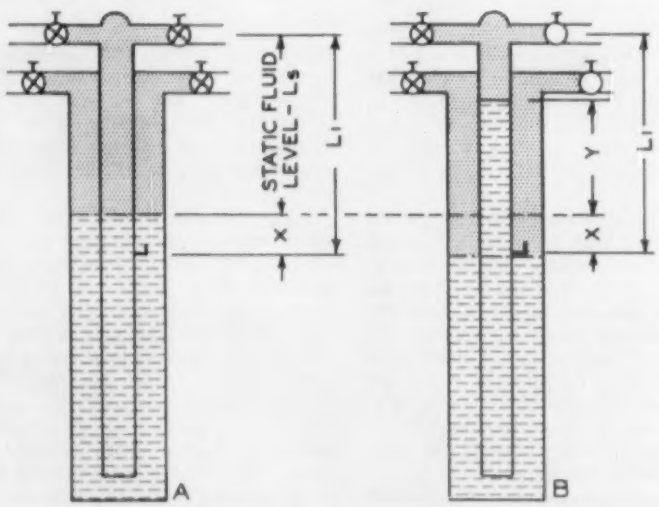


FIG. 2—When the static fluid level is down the hole, submergence of the valve and the cross-sectional areas of tubing and casing must be considered.

G_F = aerated tubing flowing gradient

G_{SF} = tubing flowing gradient below injection valve

P_{V2} = minimum casing pressure opposite valve No. 2 just before opening

P_s = back pressure on the tubing at the well head

The formula is theoretically correct for zero differential across the valve. It is currently common practice to use the above spacing formula as follows:

$$L_2 = \frac{P_{V1} - (G_F)(L_1) - P_s}{G_s}$$

where P_{V1} is:

1. Opening pressure of valve No. 1 at 60° F.
2. Opening pressure of valve No. 2 at 60° F.
3. Closing pressure of valve No. 1, or No. 2 at 60° F.

For valve No. 3, then, it follows that:

$$L_3 = \frac{P_{V3} - (L_1 + L_2)\,G_F - P_s}{G_{SF}}$$

where P_{V3} is the opening pressure of valve No. 3 at 60° F., and all subsequent valves are spaced in the same manner.

In detail . . . Now, to analyze the pressure-loaded valve-spacing problem more in detail, force balances as well as pressure balances must be used. In most pressure-loaded valves, the design can be such as to vary the effect of tubing back pressure on the valve operation from zero to some maximum figure. This can be a significant feature in the operation of the valve. Most pressure-loaded valves are susceptible to tubing back pressure in some degree. The following analysis details all significant operative forces.

The spacing of the first valve is again as has been given previously. Reference to Fig. 3 shows that for zero differential across valve No. 2, the forces tending to open the valve, F_o, are equal the forces tending to close the valve, F_c. And:

$$F_o = (P_s + G_F L_1 + G_{SF} L_2)\,A_V + P_{V-2}\,(A_B - A_V);$$

$$F_c = P_{B-2}\,A_B + S_T\,(A_B - A_V)$$

Where:

P_{V-2} = pressure in the casing opposite valve No. 2 just at opening

A_B = total effective bellows area over which the sealed-in bellows pressure P_{B-2} operates

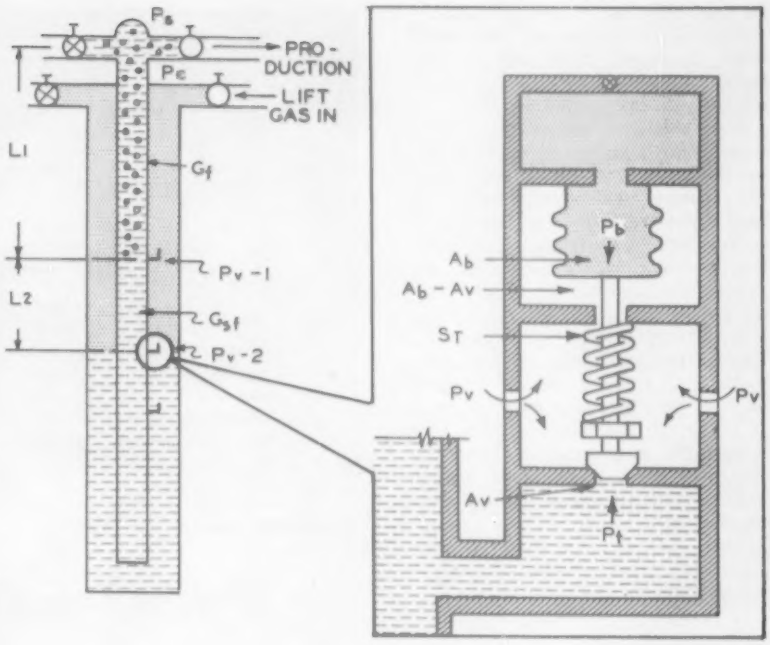


FIG. 3—In spacing pressure-loaded gas-lift valves, other than the first, the terms shown here are used. A detailed analysis of valve spacing must include effect of tubing pressure as shown on the right.

A_V = area of the valve port

S_T = effective spring tension

Substituting:

$$[P_s + G_F L_1 + G_{SF} L_2]\,A_V + P_{V-2}\,(A_B - A_V) = P_{B-2}\,A_B + S_T\,(A_B - A_V)$$

Dividing both sides by A_B and rearranging, **Equation 3** results:

$$L_2 = \frac{P_{B-2} + S_T\,(1 - A_V/A_B) - (P_s + G_F L_1)\,(A_V/A_B) - P_{V-2}\,(1 - A_V/A_B)}{(A_V/A_B)\,(G_{SF})}$$

Now both P_{B-2} and P_{V-2} from the above equation, are influenced by the setting depth of valve No. 2. This is true because the setting depth affects the operating temperature of the valve which in turn influences P_{B-2} and P_{V-2}. Therefore, the theoretically correct procedure for spacing this valve would be one of multiple trials. To arrive at the desired spacing, rearrange the equation above and solve for P_{V-2}:

$$P_{V-2} = \frac{P_{B-2} + S_T\,(1 - A_V/A_B) - (P_s + G_F L_1 + G_{SF} L_2)\,(A_V/A_B)}{(1 - A_V/A_B)}$$

Now assume a value for L_2; this fixes the depth of the valve and consequently P_{B-2}. Then, solve for P_{V-2}.

Once P_{V-2} has been determined, P_c, casing well-head pressure, can be fixed.

From a knowledge of tubing pressure at the valve, i.e., $(G_F L_1 + G_{SF} L_2 + P_s)$ and P_{V-2}, it can be determined whether or not the desired differential is established. Also, from the casing well head operating pressure, a check can be made on valve No. 1, i.e., to see if it remains closed while valve No. 2 is operating.

For valve No. 3, the force balance is:

$$F_o = [P_s + G_F L_1 + G_F L_2 + G_{SF} L_3]\,A_V + P_{V-3}\,(A_B - A_V);$$

$$F_c = P_{B-3}\,A_B + S_T\,(A_B - A_V)$$

where L_3 is the distance of valve No. 3 below No. 2, and P_{V-3} is the pressure in the casing opposite valve No. 3 just as it opens.

Charts have been prepared to facilitate this analysis. They are presented in figures included in previous installments. Several advantages to this detailed valve spacing analysis are evident: (1) it will thoroughly familiarize

the individual with the force factors involved; (2) it emphasizes the significance of spread; (3) it can be easily and quickly solved by means of charts; and (4) it is analytically correct.

A problem example will now be presented using both the conventional spacing procedure and the detailed procedure. The detailed analysis will clarify the basic assumptions that are built in to the conventional spacing formulas. This problem example will also emphasize the significance of the flowing gradient.

It is often necessary to assume a lighter flowing gradient than the design gradient, for valve-spacing purposes only. In other words, it may be impossible to reach the final operating valve by using the design gradient throughout. The information given below was obtained from the design analysis of a well installation.

Given:

1. Total liquid production = 440 bbl. per day.
2. Producing gas-oil ratio = 4,400 cu. ft. per bbl.
3. Injection gas-oil ratio = 3,810 cu. ft. per bbl.
4. Injection depth = 3,800 ft.
5. Injection pressure at final operating valve = 665 psia.
6. Static gradient = 0.50 psi. per ft.
7. Maximum available casing pressure = 650 psig.
8. Gravity of lift gas = 0.60.
9. Normal temperature gradient = 70 (1.6) (depth in hundreds of feet) = 130° F. at 3,810 ft.
10. Well-head temperature = 100° F.
11. Tubing pressure at well head = 100 psig.
12. Automatic continuous-flow valves, combination bellows and spring loaded, 150 psi. spring in each valve.
13. Valve port to bellows area ratio = 16 per cent.
14. Flowing gradient when operating from final valve = 0.15 psi. per foot.

Required:

Spacing of valve string down to final operating valve at 3,800 ft.

Solution:

The first step should be to determine the valve charge pressures that will allow the desired pressure at the final operating valve. Fully 650 psig. is the pressure to be maintained opposite the final valve at 3,800 ft. This will require a well-head pressure of 600 psig. (see Fig. 4). Now, when operating from the final valve, solving for P_{B-O} in Equation 3 will give:

$$P_{B-O} = P_{V-O}\,(1 - A_V/A_B) + (P_s + G_F L_O)\,(A_V/A_B) - S_T\,(1 - A_V/A_B)$$

Where:

P_{B-O} = bellows charge at operating temperature of final operating valve psig.

P_{V-O} = casing pressure opposite valve just at opening, psig.

L_O = depth to final operating valve, ft.

In making this estimate, the design flowing gradient should be used. So for $P_V = 650$:

$$P_{B-O} = (650)\,(1-0.16) + (100)\,(0.16) - (150)\,(1-0.16) = 435 \text{ psig. at } 130° \text{ F.} = 385 \text{ psig. at } 60° \text{ F.}$$

Therefore, the charge in the final operating valve should be 385 + 150 = 535 psig. Assuming a 10-psi. decrement in the valve string, the other valves would be charged as follows: 535, 545, 555, 565, and 575 psig.

Conventional method . . . Spacing the first valve:

$$L_1 = \frac{650 - 100}{0.5} = 1{,}100 \text{ ft.}$$

Full casing pressure will have to be applied at the surface in order to reduce the static gradient to the desired flowing gradient. With 650 psi. on the casing, pressure opposite valve No. 1 at 1,100 ft. will be 665 psig. This will give an initial unloading differential of 15 psi., and this differential will, of course, increase rapidly as the fluid in the tubing becomes more aerated.

Throughout unloading operations, however, the flowing gradient may be either greater or less than the design gradient of 0.15 psi. per foot. This is so, because the bottom-hole flowing pressure cannot be reduced to design drawdown value until shortly before the final operating valve is reached. That is, in the present example, the bottom-hole flowing pressure from the final operating valve is approximately (0.15) (3,800) + (0.5) (4,200) = 2,670 psi. Until this valve is reached and the fluid column above is aerated to the 0.15 gradient, the bottom-hole flowing pressure is in excess of the design bottom-hole pressure.

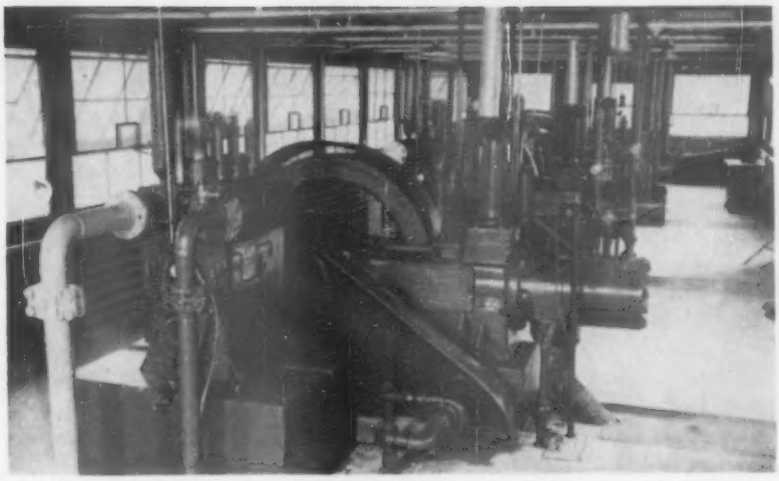
Other valves . . . Valve No. 1, a 650-psig. valve, has been placed at 1,100 ft. It can be readily demonstrated that, in order to reach the final operating valve, a lighter-flowing gradient than the design gradient must be used. This procedure is perfectly justifiable because it merely means that the desired production is not to be obtained until the final operating valve is reached. To demonstrate that a lighter gradient must be used, the valves will first be spaced by the conventional method, using the design gradient of 0.15 psi. per foot. Hence from equations in the previous installment:

No. 1 valve (650 psig.)	= 1,100 ft.
No. 2 valve (640 psig.) = [650 − (0.15) (1,100) − 100]/0.50 =	770 ft.
	1,870 ft.
No. 3 valve (630 psig.) = [640 − (0.15) (1,870) − 100]/0.50 =	520 ft.
	2,390 ft.
No. 4 valve (620 psig.) = [630 − (0.15) (2,390) − 100]/0.50 =	344 ft.
	2,734 ft.
No. 5 valve (610 psig.) = [620 − (0.15) (2,734) − 100]/0.50 =	220 ft.
	2,954 ft.

It is obvious that the final operating valve cannot be placed at the desired depth of 3,800 ft. with a 0.15 unloading gradient. A good rule of thumb is approximately 50 per cent of the design gradient for unloading operations. Therefore, assume a gradient of 0.08 psi. per foot.

No. 1 valve (650 psig.)	= 1,100 ft.
No. 2 valve (640 psig.) = [650 − (0.08) (1,100) − 100]/0.50 =	920 ft.
	2,020 ft.
No. 3 valve (630 psig.) = [640 − (0.08) (2,020) − 100]/0.50 =	756 ft.
	2,776 ft.
No. 4 valve (620 psig.) = [630 − (0.08) (2,776) − 100]/0.50 =	616 ft.
	3,392 ft.
No. 5 valve (610 psig.) = [620 − (0.08) (3,392) − 100]/0.50 =	496 ft.
	3,888 ft.

Therefore, the gradient of 0.08 will allow the final operating valve to be placed at 3,800 ft.



Interior view of pressure plant near Wellsville, N. Y., showing horizontal gas-injection engines direct connected to vertical triplex pumps.

Fuel-Injection Engines Drive New Water-Flood Plant

by Knight Thornton

A NEW water-flood pressure plant has been installed on Thornton Co.'s Fords Brook leases in Allegany field, western New York State, which marks completion of 35 years' experience in the use of controlled pressure from the surface in water-flooding operations.

The new plant consists of three fuel-injection engines without clutches or radiators. These are direct-connected through couplings to 2¼ by 4-in. pumps with ceramic plungers. Each unit has a cooling system consisting of a V-belt-driven centrifugal pump which circulates water through 2-in. pipe coils to heat the building, and a heat exchanger consisting of the annulus of a 23-ft. section of 6-in. pipe welded over the 5-in. pipe serving the suction of the triplex pumps. The horizontal section of the engine exhaust line ahead of the mufflers is water jacketed. It is tied into the engine cooling system in an effort to pick up additional heat in the suction water to the pump.

All the triplex pump piping is rigidly supported by concrete pedestals which eliminate the possibility of critical harmonic - vibration frequencies. A short trench to each pump carries both suction and discharge lines to a covered pit outside the building. This pit accommodates individual suction lines (and heat exchangers) which are carried to the filtered-water storage. A 7-in. line serves as the manifold to receive the 3-in. discharge lines from the individual pumps.

A filter plant consists of twelve 4 by 4-ft. open filters using a carborundum underplate and fine anthrafilt. These filters form a portion of one side of the 14 by 80-ft. building which houses the filters and two pumping units. Construction of this building is similar to the pressure plant building.

Each pumping unit consists of a gear-driven, eight-stage turbine pump and a centrifugal booster pump V-belted to a 5 by 6½-in. gas engine. The booster pumps are below floor level to assure flooded suction. Water is taken from the discharge of the turbines to a manifold across the top of the filters. Each filter section is connected to this manifold through a float valve, assuring controlled head. Each filter section delivers filtered water through a float valve to a clear well extending along the front of the filter platform.

Backwash water is obtained from the turbine heads through a manifold extending along the filter battery. Backwash drainoff is incorporated in each unit and attached to a manifold to carry this water to a weir at the end of the battery. Adequate valving enables individual-unit control and individual-unit backwashing.

The ability of the fuel-injection gas engines to adjust to gas of variable B.t.u. content has allowed utilization of all separator gas. Thus, with two units running, gas purchased from July 19 to August 18 amounted to 547 M.c.f. at a cost of $318. The labor cost for pressure plant and filter plant amounts to 2½ hours per day, and future maintenance costs relative to those of the past can be easily estimated by comparing the operation of three units to that of seven.

Producing wells by flowing . . . All of the producing wells on these properties have been converted to flowing, which resulted in very substantial operating economies. Flowing operations put an even higher premium on uninterrupted pressure than do pumping operations.

Thornton Co.'s Fords Brook operations have been developed in two sections. The first, or lower Fords Brook, consists of about 400 acres; the second, or 106 group, of 125 acres. From the north end of lower Fords Brook where the original plant was located to the south end of the 106 group is a distance of 2½ miles. The lower Fords Brook plant, the first unit of which was installed in 1930, was located at the extreme north end.

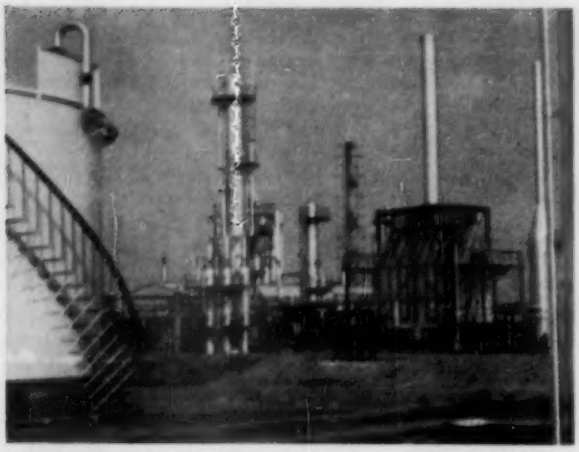
Thornton Co. entered the secondary recovery picture in 1919 when a line flood was started in the 106 district of Allegany field. The sand was of extremely low permeability and did not respond too favorably. At that time, John Bryson and Rufus Murray of Wellsville had developed the idea of adding pressure from the surface rather than depending on subsurface flooding. L. H. Thornton, who was then head of Thornton Co., heard of this and put one of its outfits in operation at Fords Brook in 1919. Three years later, in 1922, L. H. Thornton and William McEnroe, Sr., installed a Bryson and Murray outfit at Hog Brook, near Allentown, in Allegany field. This project recovered 8,000 bbl. per acre from 40 ft. of sand in about 6 years.

Other floods . . . In March 1954, the company's Oklahoma operation, Wellsville Oil Co., converted its leases from air-gas to water-flood operation. Earlier operations in Oklahoma were carried out at Chelsea field, Rogers County, in 1937.

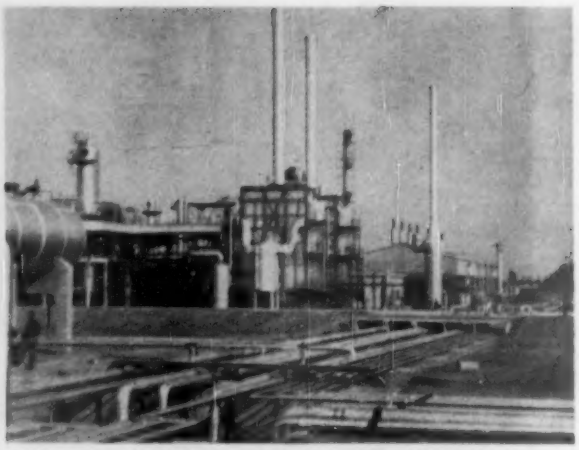
Floods were operated in Crawford County, Kansas, starting in 1947, and the Dewey area, Washington County, Oklahoma, in 1951. There also were floods in Rogers County, Oklahoma, and Miami County, Kansas, starting in 1947. Thornton Producing Corp., in 1940, started flooding operation in Chatham field, Medina County, Ohio.

Equipment used in the project included Ajax pumps and engines and Thomas couplings.

Author is partner, Thornton Co., Wellsville, N. Y.



FEED-PREPARATION section of the Montecatini petrochemical plant at Ferrara, Italy. Topping column and vaporization still are also seen in the photograph.



CRACKING UNIT showing flash column, cracking stills, and compressor house. Ethylene is manufactured at the Montecatini plant by cracking of distillates. Facilities for cracking ethane are being added.

CRUDE OIL TO ETHYLENE . . .

. . . in an integrated operation

• Completion of new ethylene cracking and other facilities of the large Montecatini petrochemical plant at Ferrara, Italy, is scheduled for the summer of 1955.

• Plant capacity will be: 13,200,000 lb. per year of polyethylene; 17,600,000 of polystyrene; and 12,000,000 of acetone. An Oxo synthesis unit will be among the new facilities.

• Key raw material is ethylene. This is manufactured by cracking of naphtha and gas oil in an integrated operation starting with crude oil.

SOON after the World War II, Montecatini, the leading Italian chemical concern, inaugurated a program for the production of synthetic resins, in particular of the thermoplastic type to satisfy the growing demands of the domestic market. It was primarily concerned with polyethylene and polystyrene.

Ethylene . . . As regards polystyrene there existed in the country an installation for producing the monomer which operated during that war. The raw material common to both resins was ethylene, which had been produced up to then for the manufacture of styrene from ethanol.

Cracking distillates . . . The company's new program had of necessity to be based upon a more economical source of raw material. Hence, it decided to obtain from crude-oil fractions the required ethylene. Since, about the same time, a demand arose for products derived from propylene, Montecatini decided to install a cracking plant for medium distillates. Design was entrusted to M. W. Kellogg Co. of New York. This unit was commissioned in the fall of 1954 at Ferrara in northern Italy, a few miles from the Po estuary, for the production of olefins.

Integrated Operation

The cycle of production is an integral one, starting directly from crude oil. The Ferrara plant consists of two sections—one, for the preparation of the charge, and the second, the distillate cracker. Petroleum arrives in tankers at Porto Marghera, some 60 miles from the plant, and is stored at a coastal depot having a capacity of 220,000 bbl. It is conveyed to the works on tank lighters of 7,000-bbl. capacity.

In short, the raw material is waterborne, one-half of the distance by sea, and the other half up the River Po. The Ferrara works are equipped with a dock for the discharge of tank lighters from which the crude oil is transferred to the plant's tanks.

Distillation . . . The crude oil is distilled in the works for the preparation of the charge of 4,500 bbl. per day capacity. This unit consists of an evaporating still for the petroleum, a topping column with two side strippers, and a gasoline stabilizer. The bottoms of the topping column are treated in a visbreaking still and fractionated in a subsequent visbreaking column.

Of the four principal products derived from distillation—gasoline, naphtha, gas oil, and fuel oil—the first is treated in the sweetening plant, brought to normal requirements, ethylated, and placed on the market, and the last is partly utilized at the works for heating purposes while the remainder is sold. The intermediate fractions—naphtha and gas oil—form the charge of the cracking plant, which handles products having a distillation range of 150°-350° C. up to a quantity of approximately 2,500 bbl. per day.

Cracking . . . In the cracker the charge is vaporized in a section of the stills, superheated steam is added, and it is finally cracked in the last section of the still. The products of cracking are suddenly cooled in the quench boilers, producing steam, and then enter the flash column. This has a lateral stripper and fractionates the liquids into three products—the end tar, gas oil from the lateral stripper, and gasoline of the top cracking. The end tar is wholly utilized in the works for heating purposes, while the heavy gas oil is employed as a flow accelerator for heavy fractions.

Gasoline stabilization . . . The cracked gas is compressed and goes to the primary depropanizer, together with the cracked gasoline. From the bottom of the column the depropanized gasoline is passed on to the stabilizer. The C_4 fraction is taken overhead on the stabilizer and from the bottom of the column the stabilized gasoline is sent to the sweetening plant.

The overhead vapors of the depropanizer are treated with diethanolamine and soda for the removal of the sulfur compounds, dried on activated alumina, and passed on to the catalyst unit for the removal of the acetylene. With an acetylene content in the C_2 fraction of less than 100 p.p.m. the gases are passed on to the separator unit for obtaining the various fractions.

Low-Temperature Separation

The separator unit is organized on various columns in cascade, all operating at low pressure and at very low temperature. The tail-gas is obtained from the top of the first column, and it consists of a mixture of methane and hydrogen; the second column yields at the top the C_2 fraction, and at the bottom the C_3 fraction. The C_2 fraction is subsequently separated into ethane, 95 per cent ethylene, and 99.9 per cent ethylene.

The requisite low temperature for the various column condensers is produced in four cycles by auxiliary refrigerators employing, respectively, as refrigerating fluids; propylene, ethylene, and methane according to the temperature of the condensers. Of these three, the first two are supplied at the start by the plant itself, which also restores the losses of the cycles, while methane is supplied from outside the works as natural gas.

Particular care was paid to the design of the low-temperature section of the plant, especially in the choice of materials capable of withstanding low temperatures, and in the preliminary arrangements for drying the crude gas, and for inversion and deicing of the appliances.

Montecatini Program

The plant is designed for an eventual maximum capacity of 56 million pounds a year of C_2 and C_3 olefins.

The cracked items are utilized thus:

1. The tail gas is employed in the plant itself for heating, etc.

2. The C_4 fraction is being stored for the time being; and, eventually, it will be separated into its components, i.e., butadiene, butylenes and butane —the first fraction for chemical applications.

3. Ethane is transferred to an auxiliary cracking unit, designed by Montecatini, for procuring a larger quantity of ethylene. This unit is scheduled to go on stream in the spring of 1955.

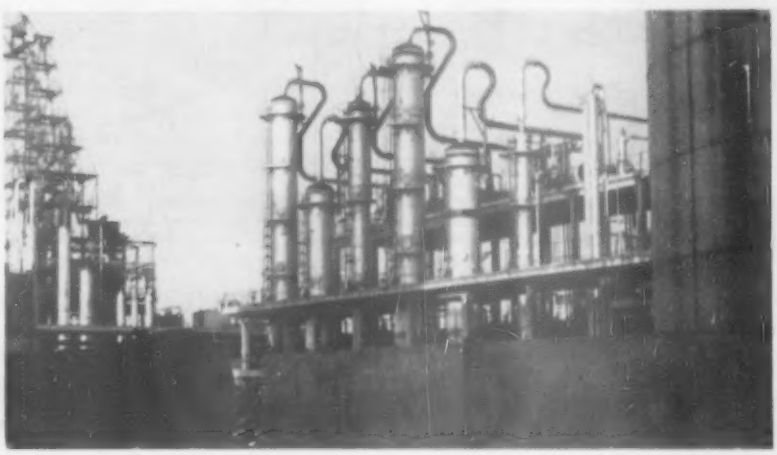
4. The C_3 fraction, obtained from the olefin plant with a content in propylene of 93 per cent anticipated, will go partly for the production of isopropanol obtained by hydration, to be subsequently converted to acetone; the rest will feed the Oxo synthesis unit for the production of higher alcohols for the manufacture of plasticizers. A rectification unit is provided for separation of the propylene-propane; the propylene from the top of the column is recycled, while propane from the bottom is sold as liquid gas for heating purposes.

5. The 95 per cent ethylene feeds plants for the production of these derivatives: dichloroethane and dibromoethane by synthesis from the respective halogens; ethyl chloride by synthesis with anhydrous hydrochloric acid; monomer styrene by alkylation of benzol and subsequent dehydrogenation catalysis, and finally, ethylene oxide for conversions into glycols. Part of the latter are to be utilized by the installation for the production of Terylene (Dacron in U.S.A.).

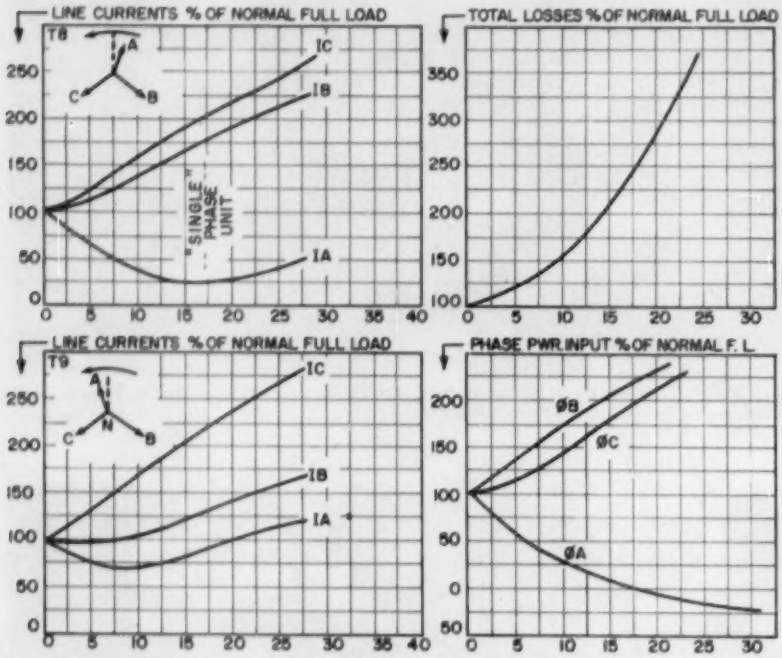
6. The gasoline from the cracking process is treated similarly to the primary gasoline in the sweetening plant, for the removal of resins on a bed of activated earth; the gasoline thus treated is inhibited, ethylated, and sold on the market.

The entire installation is scheduled to be commissioned in the summer of 1955. The respective production figures of the principal olefin derivatives are: polyethylene 13,200,000 lb.; polystyrene 17,600,000 lb.; and acetone 12,000,000 lb., per annum. These capacities, as also those pertaining to other derivatives, can be augmented when increased demand calls for expansion of the olefin cracking unit.

COMPRESSOR HOUSE of the polyethylene unit at the Montecatini works in Ferrara. Polyethylene capacity will be 13,200,000 lb. per year.



FINAL styrene monomer rectification section. Polystyrene is one of the principal products.



EFFECTS of unbalanced voltages charted above are: Fig. 1 (top left) line currents, Case 1; Fig. 2 (bottom left) line currents, Case 2; Fig. 3 (top right) typical total losses; and Fig. 4 (bottom right) power input by individual phases, Case 1.

For better protection of beam-pumping motors . . .

Try using three overload relays instead of two

by L. U. Eidson

FOR motors normally used in oil-well pumping, three-phase overload relays seem to offer the most practical protection against excessive temperatures caused by unbalanced voltage conditions. Many conditions of unbalance which could escape detection by conventional two-coil overload relay can be noticed with the three-coil unit.

The merits of motor-protective devices are frequently given for particular examples of single-phase operation. But there are many examples of single-phase conditions and many resultant conditions of each example. What's more, causes of the conditions associated with single-phase are not limited to loss of a phase circuit alone. So let's be complete about it and evaluate the protective device in terms of the fundamental problem—unbalanced voltages.

Single-phase conditions . . . When one phase of the three-phase circuit supplying an induction motor is opened, unbalanced voltages exist at the motor terminals and unbalanced currents flow in the windings. Open lines, either in the supply circuit or in the individual motor circuit, are common occurrences. They might result from a loose connection or a blown fuse.

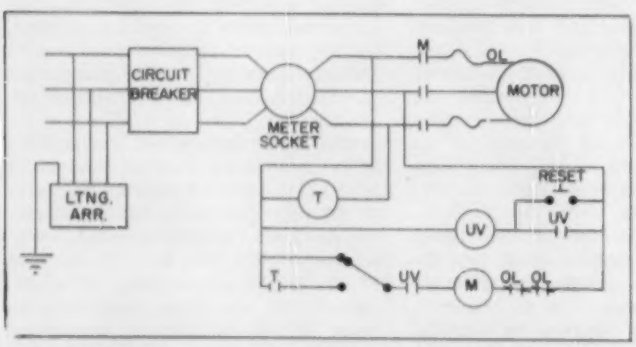
Some of the other causes of unbalance are: (1) open delta transformer banks; (2) dissimilar single-phase transformers in a three-phase bank; and (3) unbalanced single-phase loads. Less frequent causes are operation of motors with coils cut out of one phase, and nontransposition of long transmission lines.

Operation of motors on unbalanced voltages results in increased losses and unbalanced currents. The per cent of current unbalance may be as great as five to ten times the voltage unbalance, but the amount of current unbalance for a particular motor and load cannot be predicted from the magnitude of voltage unbalance alone.[1]

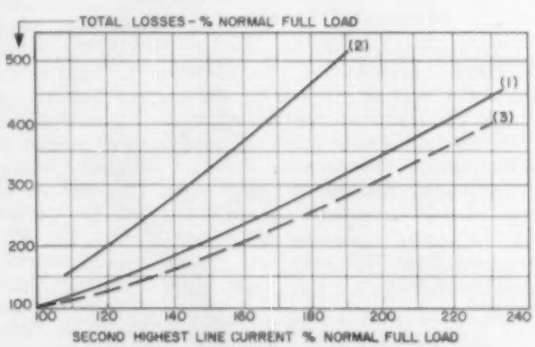
The data included in this paper, typical of the tests made, was obtained from tests of a 1-hp., 1,735-r.p.m., open, wye-connected motor which was loaded with a constant, approximately-

Author is with Westinghouse Electric Corp., Houston. Digest of paper presented at 1954 Petroleum Electric-Power Conference, New Orleans.

1. Reference to per cent voltage unbalanced in this paper applies to N.E.M.A. Standards No. MG1-6.7a definition:
Per cent unbalance = Max. voltage deviation from average/Average of the three unbalanced voltages.



THIS TYPICAL starter circuit has only two overload relays; the included potential devices give some measure of unbalance protection. Fig. 5.



MOTOR LOSSES charted above are: (1) loss seen by relay; (2) actual loss, Case 1; and (3) actual loss, Case 3. Fig. 6.

rated-torque load. Figs. 1 and 2 show line currents, Fig. 3 shows increased losses, and Fig. 4 shows motor input for various unbalanced voltages.

The unbalancing method used for Case 1, and Figs. 1 and 4, shifted the phase angle of one voltage in a lagging direction. For Case 2, the voltage was unbalanced the same amount but with a leading phase angle. Note in Fig. 4 that the change in power input to phase A decreases as the voltages are progressively unbalanced. With further unbalance, the power input to this phase becomes zero and then becomes negative, i.e., power is delivered back to the line.

Protection by two-coil starter . . . A typical starter may include a three-pole circuit breaker, a contactor with two overload relays, a reset relay, and a timing relay. The contactor coils, reset relay, and timing relay are generally connected across different phases to give some measure of unbalanced-voltage protection.

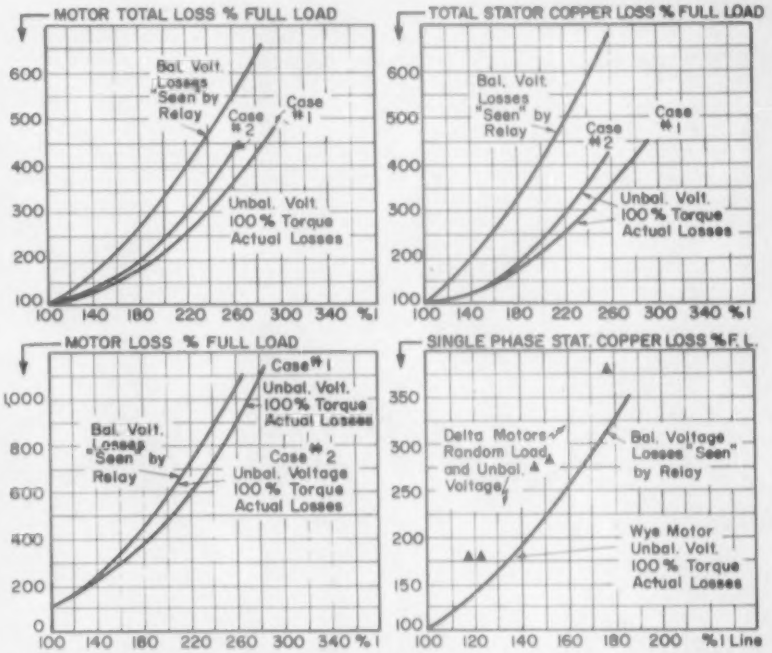
When running, the motor terminal voltage will be above the dropout value of these devices under all but the most severe cases of unbalance. When stalled, one phase of the motor voltage might be reduced sufficiently to drop out one of the relays or the contactor.

When only two thermal overload relays are used, the phase with the highest current during unbalance operation may not contain an overload relay. As a result, the motor losses and temperature rise may be considerably higher than indicated by either of the two lower-phase currents. This is shown by Fig. 6 and Curves 1 and 2.

For the case of Curve 2, total losses —as well as the stator copper losses of the phase with the highest current—are greater than indicated by the second-highest line current. An example of unbalanced operation in which the second-highest current indicates higher-than-actual total losses is shown by Curve 3. In this case, the large copper loss of the highest-current stator phase are still not recognized.

The circuit breaker or fuses included in the starter are normally intended for short-circuit protection. Their current operating value generally, will be too high for unbalanced-voltage protection.

Protection with three relays . . . The overload capability curve of a motor on balanced voltage may be expressed in terms of motor line current and time. Using current as a yardstick, replica-type overload relays operate with a current-time characteristic similar to the motor capability curve.


MOTOR TOTAL LOSS % FULL LOAD
Bal. Volt. Losses "Seen" by Relay
Case #2
Case #1
Unbal. Volt. 100% Torque Actual Losses
TOTAL STATOR COPPER LOSS % FULL LOAD
MOTOR LOSS % FULL LOAD
Case #1
Unbal. Volt. 100% Torque Actual Losses
Bal. Volt. Losses "Seen" by Relay
Case #2
Unbal. Voltage 100% Torque Actual Losses
SINGLE PHASE STAT. COPPER LOSS % F. L.
Delta Motors Random Load and Unbal. Voltage
Bal. Voltage Losses "Seen" by Relay
Wye Motor Unbal. Volt. 100% Torque Actual Losses
% I Line

OTHER EFFECTS of unbalanced voltages here are: Fig. 7 (top left) total motor loss; Fig. 8 (top right) total stator copper loss; Fig. 9 (lower left) rotor loss; and Fig. 10 (lower right) individual phase stator copper loss.

With unbalanced voltages, however, the magnitude of line currents may no longer be an exact indication of motor losses or temperature rise. It is for this reason that the adequacy of even three overload relays is sometimes questioned. On the basis of tests made for this paper, however, three overload relays do a surprisingly good job.

Fig. 7 shows a comparison of motor losses with respect to current for balanced-voltage overloaded operation and unbalanced-voltage, rated-torque operation. Values for the two types of unbalance mentioned for Figs. 1 and 2 are shown. Stator copper losses, Fig. 8, and rotor losses, Fig. 9, are given for each case. Rotor-loss curves include both copper and iron losses.

The losses for balanced voltages are plotted against motor curernt for any one phase, while those for unbalanced voltages are plotted against the highest of the three line currents. Currents are expressed as percentages of nameplate or rated current.

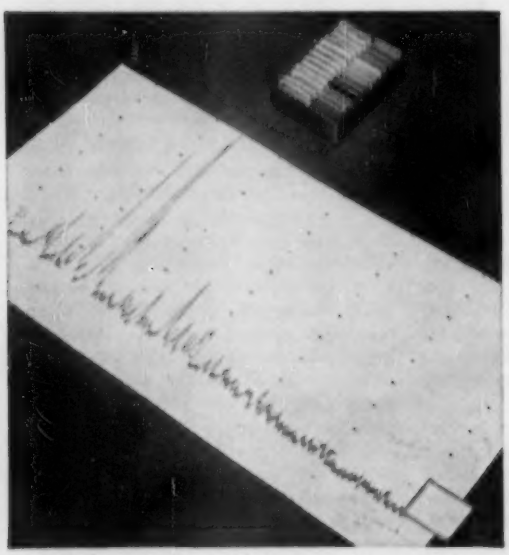
The above data pertains to a wye-connected motor. Rotor losses, stator iron losses, total stator copper losses, and motor total losses should be the same, however, for any given motor load, and degree of unbalance whether the motor be wye or delta connected. The individual stator-phase copper losses may not be the same, however.

With a delta motor and unbalanced applied voltages, one stator phase may have I^2R losses than is indicated by the line currents. Examples of this are shown on the individual stator-phase, copper-loss curve of Fig. 10. This may not be as serious as it seems, however. The phase with the largest losses will lose some of its heat to the cooler and adjacent phase windings. It might also be noted that overload relays applied for balanced voltage overload protection of small motors usually have a large margin of safety between motor-heating time and relay-tripping time.

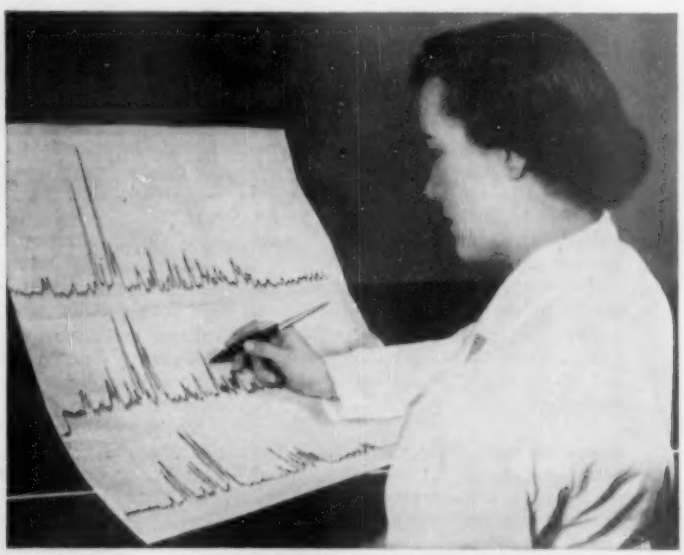
On the basis of the above tests, the use of three overload relays has merit. For a very reasonable investment, the third relay may be added to obtain considerably more protection than provided by two overload relays. The possibility of erratic operation of the relays with respect to motor losses, as previously mentioned, does exist. But it seems to be on the safe side for many and perhaps most unbalanced conditions.

It is quite possible that the overload relays may in some cases of voltage unbalance overprotect the motor. When voltage unbalance is only occasionally experienced, premature relay operation during unbalanced conditions should be acceptable.

Positioning deposit sample in path of X-ray beam. Crystals of the deposit will diffract the beam, and a characteristic pattern is recorded on the chart at left.



"Fingerprint" of the deposit is recorded on this chart—showing which compounds are present in the deposit sample.



Comparison of sample "fingerprint" with Ethyl's master file of synthesized compounds permits positive identification of chemical compounds present in the sample.

Ethyl Research "fingerprints" engine deposits

Ever since the invention of the internal combustion engine, refiners and automotive engineers have known that under certain conditions engine deposits can create problems.

But to this day, no one is certain which of the many chemical compounds present in the deposits actually cause the trouble.

Ethyl research people have come up with several techniques that promise to give part of the answer.

One of these new techniques—called the "fingerprint" method—works something like this:

A special thermal plug is installed in the engine combustion chamber. Deposits are allowed to build up on the plug, which is held at a controlled temperature. After a certain time, the plug is removed, and the deposits are analyzed.

To identify the compounds present in the deposit, ordinary chemical analysis proved unsatisfactory, so Ethyl people turned to X-ray diffraction. But here again they met a problem. No master identification charts existed for these complex chemicals.

Ethyl synthesized many of the compounds they thought might be in the deposits and made X-ray diffraction "fingerprints" of them. Now, with this unique master identification file, the majority of complex inorganic chemicals present in engine deposits have been identified.

With this basic research tool, Ethyl people are studying the mechanism of deposit formation and gaining new understanding, which will lead to more effective scavenging of engine deposits in the future.

ETHYL CORPORATION
Research Laboratories
1600 West Eight Mile Road, Ferndale 20, Michigan
2600 Cajon Road, San Bernardino, California

Thermal plug in place in single-cylinder research engine. After a certain period enough deposit builds up on its temperature-controlled surface to provide a satisfactory sample.

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an added "Range" for close tolerances.

A size and type to EXACTLY meet your requirements

With the addition of the new "15-Range," Baker HINGE-LOK Casing Centralizers are now available for *all* combinations of casing sizes and hole sizes. From "slim" holes to large-diameter, oversize, irregular holes—or even where cavities are anticipated—there is a Baker HINGE-LOK Casing Centralizer to start without "snubbing" and to provide a *positive, uniform annular cementing space around the casing.* • Any Baker representative or office is ready to help you get "first-time" cementing results with Baker HINGE-LOK Casing Centralizers. To *end* right, *start* right—call BAKER.

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. . . for easy starting in "slim" holes, without "snubbing."

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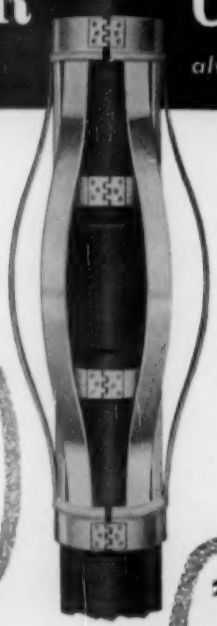
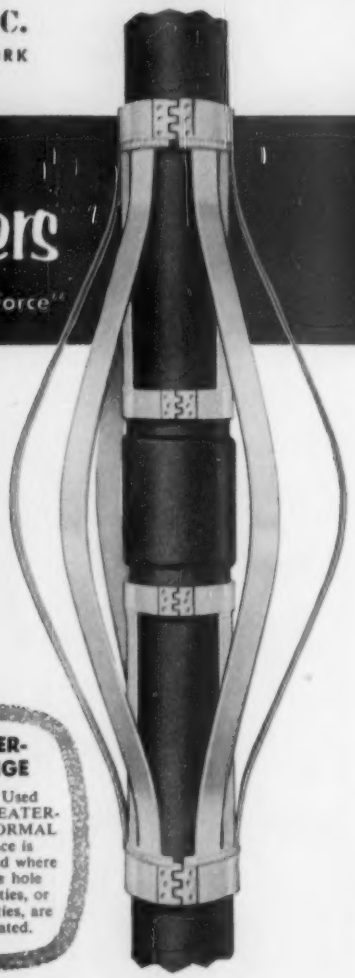


20-RANGE
Used where LESS-THAN-NORMAL clearance is present between the casing ON which centralizers are run and the casing THROUGH which they are run.

25-RANGE
Used where NORMAL clearance is present, and no serious problem of over-size hole is anticipated.



SUPER-RANGE
"H-50" Used where GREATER-THAN-NORMAL clearance is present and where extensive hole irregularities, or even cavities, are anticipated.

ELECTRIC LOGGING: 51

Logging With Gamma-Ray and Neutron Techniques

by R. I. Martin

AT present there is no uniformity of scale used by service companies for gamma-ray logs. One company uses counts per second per scale division. The counts per second are approximately equal to the number of gamma rays intercepted by the counter per second. This method is an almost direct measure of radioactivity. The sensitivity of the recording instrument may be changed and may easily be allowed for.

Another company shows the deflection in inches, produced when a standard source of radioactivity is held against the logging device. Since the response of the instrument is linear, it is possible to take into account the difference in sensitivity of two logs by direct proportion.

A third company uses a unit developed by the Bureau of Standards. This is microroentgens per hour, and is based on a standard source of radioactivity placed at a specified distance. It is practical to calibrate the various types of instruments in these units, and it would be a considerable advantage if this were done.

Limestone . . . The curves obtained on a gamma-ray survey do not require that the formation have permeability. Limestones and dolomites occurring between shales produce a peak to the left on gamma-ray logs. It is not possible to determine from these logs alone which parts of the formation are porous. Consequently a second radioactivity curve has been developed, a neutron curve.

Neutron logging . . . For many years, a neutron log was obtained by using a source of neutrons to bombard the formation and measuring the gamma radiation resulting. Because this method also measures gamma rays, a second run is necessary to obtain the log. Because this is a serious disadvantage from the rig-time point of view a new method was introduced in 1950. This type measures the concentration of neutrons which return to the instrument after a similar neutron bombardment. The equipment makes it possible to obtain gamma-ray logs and neutron logs on one run into the well, which saves considerable time. Other advantages will be apparent later.

It will be convenient to refer to the earlier method as a neutron-gamma long, and to the new one as a neutron-neutron log.

Neutrons are particles of almost the same mass as hydrogen atoms, but have no electric charge. Because of this absence of charge, they pass through considerable thicknesses of most substances.

Neutrons for well logging are produced from a mixture of beryllium and a radioactive element which emits alpha particles. When the nucleus of a beryllium atom is struck by an alpha particle of sufficient energy, the beryllium atom is shattered. This results in the emission of neutrons with a velocity of several thousand miles per second. No radioactive element is known to emit neutrons by itself. Beryllium or some similar substance is necessary for this reaction.

The fast-moving neutrons are gradually slowed by elastic collisions with other atoms. In elastic collisions, the neutrons and atoms recoil with no loss of combined momentum. But since the neutrons lose some momentum at each collision, they gradually lose their speed.

Fortunately, elements vary greatly in their powers of slowing down neutrons. This is very important in neutron logging. Neutrons bounce off heavy atoms with a relatively slight loss of energy, but atoms which have a mass closer to that of the neutrons slow them faster. Because the mass of hydrogen atoms is almost equal to the mass of neutrons, this element has greater powers of slowing neutrons than any other. Accordingly, where hydrogen is abundant, neutrons are slowed relatively close to the source. Where hydrogen is scarce, neutrons penetrate further before being slowed.

Eventually the neutrons are slowed until they have a velocity in keeping with their mass and temperature. Neutrons which are traveling at this velocity are known as thermal neutrons. Neutrons which travel at high speeds are rarely adsorbed by the atoms with which they collide. Thermal neutrons, on the other hand, are much more likely to become adsorbed. Before they are adsorbed, however, thermal neutrons diffuse —just like atoms of gas—but for a very short time interval. At each point near the source, there is a certain concentration of thermal neutrons. It is this concentration of thermal neutrons which is measured by both neutron-gamma and neutron-neutron logs, although the methods differ.

In neutron-gamma logging, gamma rays are measured. The most important of these are powerful gamma rays emitted when a neutron is captured by an atom. These are known as gamma rays of capture. The gamma rays of capture of hydrogen are exceptional in that they are less penetrating and have less energy than the gamma rays of capture of most elements.

As a result of this, rocks containing hydrogen will give a low gamma-ray signal. Unfortunately, it does not matter how this hydrogen may be combined. Hydrogen in hydrocarbons, in connate water in reservoir rocks, in connate water in shales, and in clay minerals will have the same effect, which depends only on the concentration of the hydrogen.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

by
Dr. R. F. Nielsen

ENGINEERING FUNDAMENTALS

Performance of External Gas Drive—1

IN calculating performance of a gas drive or air drive, it has generally been necessary to make certain simplifying assumptions. One is that a producing gas-oil ratio is determined by average (volumetrically weighted) saturation and mean pressure.[1,2] That is, in mean reservoir cubic feet per cubic foot, gas-oil ratio (G.O.R.) = $k_o\mu_g/k_g\mu_o$. G.O.R. will change with time in accordance with oil production, and relative permeabilities are assumed to be determined by average saturation.

This assumption usually gives high values of G.O.R. for a given cumulative oil production because oil saturations are higher than average near producing wells. Hence, methods evolved[3,4] that assume modifications of the Buckley-Leverett procedure and that give saturation distribution.

Neglecting capillarity and gravity drainage, fractional flow of gas F at any point, on a volumetric basis at reservoir conditions, is:

$$F = k_g\mu_o/(k_g\mu_o + k_o\mu_g) \quad (1)$$

if water phase is immobile. Viscosities must correspond to conditions of the drive, and relative permeabilities to saturations at the given point.

If saturation varies continuously with distance, this form of the continuity equation gives the instantaneous rate of advance of a gas saturation S:

$$(dx/dt)_S = (q/fA)\,(dF/dS)_S \quad (2)$$

where q is total volumetric rate, A is cross-sectional area, and f is porosity. For radial flow:

$$(dr^2/dt)_S = (q/\pi hf)\,(dF/dS)_S \quad (3)$$

where h is sand thickness and q is flow through the cylindrical surface a distance r from the well. If the saturation gradient is small enough so that capillarity can be neglected, dF/dS is a function of S only, and is given by the slope of a plot of F (Equation 1) against S (Fig. 1).

To use the equation, assume that q (and hence pressure) does not vary materially with distance, and that saturation range was initially contained within a small volume. Then, neglecting solubility, when a volume $Q = q\,\Delta t$ of gas (reservoir conditions) has been injected, a saturation S has moved through a pore volume $\Delta PV = fA\,\Delta x$ (or $\pi fh\,\Delta r^2$) = $Q\,(dF/dS)_S$. If an oil bank is ahead of the gas drive, the maximum distance any saturation can move is such that $Q/\Delta PV$ is change in average saturation behind the bank, or $Q/\Delta PV = (dF/dS)^{-1} = S_{av}$ behind the bank, since $S = 0$ in the bank.

Hence, the tangent drawn from $S = 0$ to the F curve touches the curve at saturation S^* just behind the bank, and intercepts the $F = 1$ line at average saturation S_{av}^* behind the bank. From S_{av}^* and the initial average saturation, it should be possible to calculate total production up to gas breakthrough if pore volume of the system and sweep efficiency are known.

Behind the bank, saturation varies from S^* to S (max). It may be shown that average saturation S_{av} behind any given saturation S in this region is given by the $F = 1$ intercept of the tangent to the curve at S:

$$(dF/dS)_S = (1 - F)/(S_{av} - S) \quad (4)$$

The top part of the F curve is normally flatter than in Fig. 1, so an exaggerated plot is necessary to draw tangents.

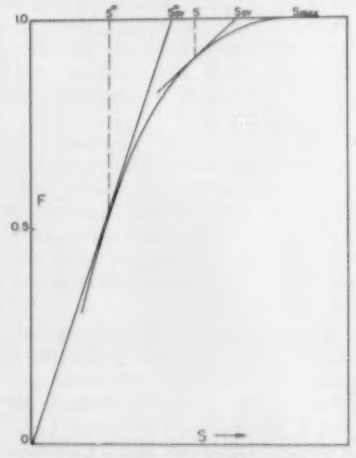


Fig. 1—Using a plot of fractional gas flow against gas saturation when there is an oil bank ahead of the injected gas.

Oil and gas production as a function of gas-oil ratio after gas breakthrough may theoretically be calculated from the previous relation if we know pore volume drained, sweep factor and its change with time, and the quantities needed to obtain the F curve. In a pattern drive, sweep efficiency may be controlled in part by capillarity effects and extent of the oil bank (if there is gas ahead) as well as by mobility ratio. If the latter is not too low, sweep factors[5] might be estimated.

After the sweep factor becomes essentially constant, F is calculated from surface G.O.R. by:

$$R\,(res) = [R\,(surf) - s]\,\alpha/\beta$$
$$= F/(1 - F) \quad (5)$$

where s is solubility in s.c.f./c.f. S.T.O., and β and α are oil and gas-formation volume factors (dimensionless). Intercepts of the tangents for a series of calculated values of F give average gas saturations. If water production is negligible, oil production between two successive values of S_{av} is:

$$Q\,(STB) = PV\,(S_2 - S_1)/5.61\beta \quad (6)$$

According to Equations 2 and 3, when a saturation S has moved through a pore volume PV, total reservoir fluid throughout is $PV/(dF/dS)_S$. Gas production (s.c.f.) between two average saturations is, therefore:

$$\Delta G = (PV/\alpha)$$
$$\times [(dF/dS)_{S2}^{-1} - (dF/dS)_{S1}^{-1}] \quad (7)$$

minus the reservoir cubic feet of oil produced in the interval, where dF/dS is the slope of the tangent to the curve from S_{av} at $F = 1$.

Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.

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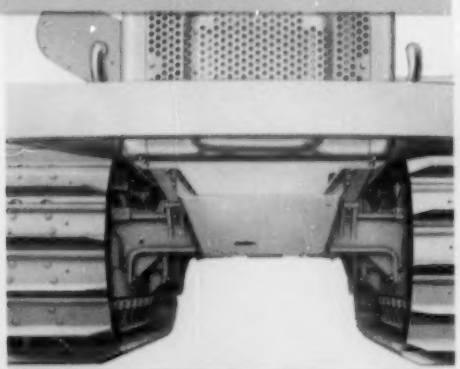

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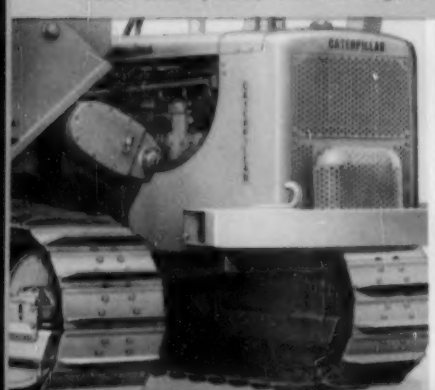

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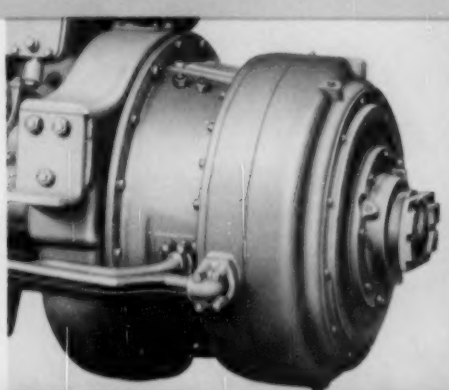

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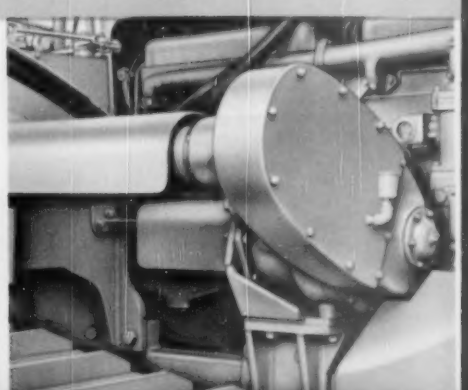

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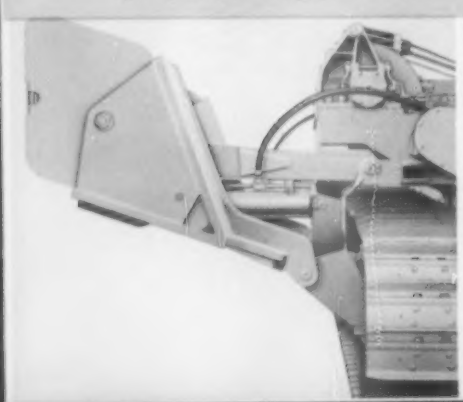

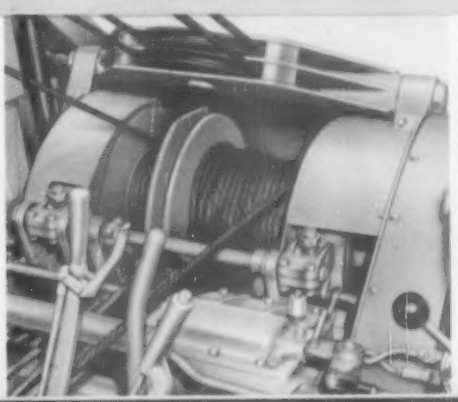

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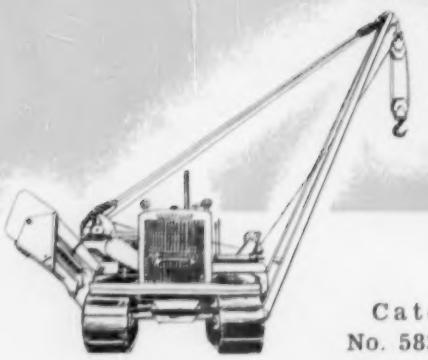

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NEW NO. 583 PIPELAYER—ANOTHER EXAMPLE OF CATERPILLAR LEADERSHIP IN ACTION

by **W. L. Nelson**
Technical Editor

QUESTIONS ON TECHNOLOGY

Wax Content of Crude Oils—U. S. A. and Venezuela

"What is the wax content of various crude oils? Do Pennsylvania crude oils contain more wax than our Mid-Continent crudes?" G. M. P.

Although the wax-distillate fraction of Pennsylvania crude oils is quite waxy, the amount of wax distillate in most Pennsylvania oils is so small that the wax content of the Pennsylvania crude oils is sometimes lower than the wax content of Mid-Continent oils. The very highest wax contents are found in certain mixed-base or intermediate paraffin-base oils of Venezuela or Burma. In these, the dewaxed oils are intermediate or even naphthene base in their properties and only their very high wax content causes the raw stocks to be classified as paraffinic.

Little information on wax content is available in the literature and confusion often arises because the meanings of such terms as "wax," "paraffin," "petroleum wax," etc., used by various authors is not disclosed. In addition, some of the wax contents reported in the literature were obtained on stocks that had been destructively distilled. In Tables 1 and 2, paraffin wax referes to wax derived from material boiling in the general range of wax or paraffin distillate, that is 700°-900° F., whereas total wax means the entire wax (paraffin and microcrystalline) and it is hoped that the meaning of the various authors has been properly interpreted.

The wax contents of various world crude oils will be presented in the next installment of this page.

TABLE 1—WAX CONTENT OF U.S.A. CRUDE OILS AND RESIDUES

		Wax		
Crude oil—	A.P.I.	Per cent in crude	Per cent in residuum	Kind or source
Arkansas:				
Smackover, light	27.1	2.64	4.2	(A)
Smackover, heavy	23.0	2.44	3.4	(A)
Smackover, heavy	22.6	2.1	....	(A)
California:				
Huntington Beach	26.2	1.9	....	(A)
Midway	20.0	0.6	....	(A)
Santa Fe Springs	32.1	1.5	....	(A)
Kansas:				
Butler Co.	35.5	0.54	....	(B)
Butler Co. (tank bottoms)	35.1	6.6	....	(B)
Louisiana:				
Caddo	24.3	0.09	0.11	(A)
Rodessa	43.2	5.2	....	(A)
New Mexico:				
Hobbs	32.6	0.26	0.6	(A)
Oklahoma:				
Earlsboro (East)	40.5	1.76	4.8	(A)
Lucien	42.2	2.42	6.9	(A)
Mid-Continent	....	6.0	....	(A)
Oklahoma City	38.6	4.0	....	(A)
Tonkawa	42.4	1.97	6.3	(A)
Tonkawa	43.2	2.1	....	(A)
Tonkawa-Marshall	....	1.4-3.7	....	(A)
Pennsylvania (average)	44.3	2.4	....	(A)
Texas:				
Big Lake	....	1.7	....	(A)
Breckenridge	33.8	0.37	0.68	(A)
Cook	40.3	0.88	2.0	(A)
Electra (South)	39.1	1.03	2.6	(A)
Longview (E. Texas)	39.0	3.16	7.3	(A)
Longview (E. Texas)	38.8	7.0	....	(A)
Luling	26.4	0.06	0.09	(A)
Oldham	38.4	0.04	2.5	(A)
Panhandle	43.2	6.0	....	(A)
Pecos Deep	29.5	0.29	0.5	(A)
Placedo	24.8	0.4	....	(A)
Ranger	....	2.2	....	(A)
Rock Crossing	34.4	0.66	1.3	(A)
Upton	27.8	1.01	1.7	(A)
West Texas (Pecos)	29.1	0.25	....	(A)

(A) Total wax. (B) Microcrystalline.

TABLE 2—THE WAX CONTENT OF VENEZUELAN CRUDE OILS

			Wax			
Crude oil—	A.P.I.	Approx. character-factor of lube stock	Per cent in crude	De-waxed to this pour point (°F.)	Per cent in 700°-900° F. fraction	Kind or source
Barinas (Silvestre)	28.2	11.8	1.0	....	5.5	(C)
Barinas (Silvestre)	28.8	11.85	1.4	....	8.0	(C)
Cabimas	21.4	11.65	0.51	....	3.8	(C)
Chimire	34.5	12.17	†9.65	1	42.3	(C)
El Mene	37.0	11.65	4.6	....	†19.2	(A)
Ensenada:						
Ensenada Zone	57.7	12.1	0.46	....	9.2	(A)
Palmas Zone	43.4	11.95	7.0	....	....	(A)
8,810-9,183 ft.	40.8	....	9.4	....	....	(A)
9,328-9,680 ft.	37.8	....	6.5	....	....	(A)
Guara	39.3	12.0	‡3.27	3	21.1	(C)
Guario	50.0	12.4	§†1.81	5	§49.0	(C)
Guere	31.3	12.2	‡6.95	zero	30.4	(C)
Inca	30.4	11.7	‡2.68	zero	17.9	(C)
La Concepcion	36.2	....	3.35	....	....	(A)
La Concepcion	35.0	....	3.6	....	....	(A)
La Paz	27.5	11.95	0.5	....	†1.54	(A)
La Rosa	24.0	11.7	0.7	....	†2.5	(A)
Las Cruces	31.1	12.05	3.7	....	†9.5	(A)
Lagunillas	15.7-17.4	11.5	0.35	....	†1.1	(A)
Mene Grande, Lt.	25.7	11.6	1.5	....	†4.1	(A)
Mene Grande, Hvy.	17.4	11.35	0.45	....	†1.6	(A)
Oficina	29.9	11.9	‡6.04	—3	26.5	(C)
Pueblo Viejo	20.2	11.25	0.95	....	†3.0	(A)
Ruiz	32.1	12.2	‡4.55	7	*27.6	(C)
Rincon Largo	43.4	12.45	15.8	....	†54.0	(A)
San Roque	39.0	12.35	20.7	....	*55.1	(A)
San Roque	54.5	12.44	‡0.89	3	55.6	(C)
San Joaquin	44.0	12.5	§†7.7	....	§52.0	(C)
San Jose	13.5	11.35	0.85	....	†2.7	(A)
San Jose	15.3	....	1.12	....	....	(A)
Sibucara	36.0	12.44	‡4.77	5	24.0	(C)
Tabascana	33.3	12.14	‡10.56	5	39.2	(C)
Yopales	23.0	11.63	‡2.7	—17	12.9	(C)

*700° F. plus fraction, about 75 per cent of which boils to 900° F. †Estimated as 60 per cent of the wax appearing in 700°-900° F. fraction. ‡Only paraffin wax of a 700°-900° F. fraction. §Estimated. (A) Total wax. (B) Microcrystalline. (C) Paraffin wax.

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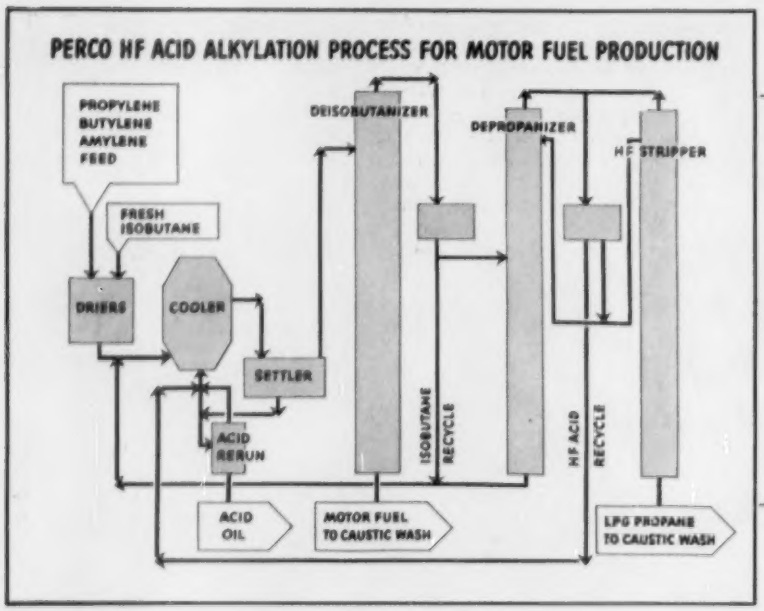

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Compressor Maintenance—1

How Tide Water Uses Continuous Cleaning

by H. B. DeBenedetti

THIS series will describe preventive-maintenance practices and experiences encountered in gas-engine and compressor operation at the Avon, Calif., refinery of Tide Water Associated Oil Co. Compressor problems there have varied with the type of gas being handled. Gases and vapors handled at Avon are sulfur dioxide, air, propane, and overhead compressibles from thermal, straight-run, and catalytic cracking units.

Tide Water, and other refiners, have had troublesome experiences with valves, pistons, piston rings, and cylinders on machines compressing cat cracker gases. The trouble resulted from: (1) gumming of compressor valves; (2) heavy fouling of pistons, cylinder walls, cylinder heads, and piston rings; and (3) sticking of rod packing.

Compressor crews were continually at work cleaning parts. Compressor service factors were poor and maintenance charges were high. Something had to be done.

Improvements in cracking equipment and methods demanded that compressors and their drives operate at peak performance with a minimum of down time. We have met this demand by cleaning our gas ahead of the compressors and by continuous on-stream cleaning of the compressor cylinders.

Gas cleanup ahead of compressors. This was done by passing the gas through a vessel containing water sprays and then through a separator. This gas cleanup helped, but did not sufficiently improve machine-service factors.

Continuous cleaning in compressor cylinders . . . Ultimate solution to our compressor-cylinder and associated-parts fouling was to install a continuous on-stream cleaning system.

It was known from previous cleaning experience that the fouling compounds were water soluble. It had been our practice to unhead the compressor, pull the piston with its rod and rings, and pull the valves. These parts could then be easily cleaned with a mixture of steam and water.

The trouble with the old system of cleaning was the sacrifice of the machine-service factor. The actual cleaning took little time; but the time required to remove and reinstall compressor parts was prohibitive.

The problem was solved by introducing steam into each compressor cylinder. The fouling materials are now continuously washed out of the cylinder and out of its parts. Service factors were immediately improved and maintenance expenditures dropped.

Now we rarely need to unhead a cylinder and pull its piston for cleaning. Before steam washing we had to do this at approximately 2-week intervals. Except on rare occasions, we now need to pull pistons only at scheduled turnarounds. Valve servicing is done between turnarounds. Current average valve life is about 6 months.

Steam is injected into each compressor cylinder individually. The inlet nozzle was tapped in each case.

Steam supply . . . Supply lines delivering steam for this service are and must be adequately protected against water shots. Water accumulation in steam-supply lines could result in compressor damage if water were to enter the cylinder in sufficient amounts to fill up the compressor clearance space at the ends of the stroke.

Lubrication . . . The use of steam as a cleaning agent in compressor cylinders may require a change of lubricant. It was our experience that the steam washed ordinary lubricants off the piston and cylinder walls. It was found, however, that wall and piston-surface lubrication could be easily restored by using an oil containing approximately 5 per cent lard oil.

Corrosion . . . The successful use of steam as a cleaning agent in compressor cylinders depends on the makeup of the gas being handled. Material in the gas, which might form corrosion products when in contact with moisture, may void its use. Early inspection following the introduction of steam to compressor cylinders will reveal the presence or lack of corrosive attack.

We have not encountered corrosion in our installation. Precompressor cleanup of the gases to be handled has removed the corrosive compounds. This cleanup is accomplished by water washing, chemical injection, and mechanical separation.

Use of hydrocarbon as continuous cleaning agent . . . Heavy distillate can be injected as a cleaning agent where steam cannot be used. Rate of injection should be from 1 to 5 gal. per day per cylinder. Injection should be made in the cylinder-inlet nozzle with the tip of the injector approximately centered in the nozzle bore. The tip of the injector should be fitted for spraying. Pumping of the distillate can be done with a high-capacity pump similar to those used on engine and compressor lubricators.

Here again the precaution of guarding against liquid accumulation between piston and cylinder heads is important. Operators of compressors using an injection of condensibles for continuous cleaning purposes must be fully aware of the damage possible in event they should become careless with its use.

Author is with Tide Water Associated Oil Co.'s manufacturing department, Avon refinery, California. From paper presented at C.N.G.A. meeting.

Designing and Applying High-Speed Turbines—3

by H. Steen-Johnsen

THE last installment described and illustrated high-speed turbine design for units rated up to 5,000 hp. at 12,000 r.p.m.

For horsepowers higher than the foregoing, the last blade row can be doubled up as illustrated, Fig. 1, using what is commonly called a double-flow exhaust. A machine of this design could go up to 10,000 hp. and 12,000 r.p.m.

In the arrangement of the valves and the bearing case, it is well to look for items that facilitate maintenance. The steam-chest cover can be lifted without breaking the leak-off connections. And on the bearing case, the maximum number of parts and connections are in the lower half so the cover can be lifted for internal inspection without breaking oil-pipe flanges.

Blading design . . . Because the last-stage blade determines the maximum flow capacity of a condensing turbine, it should be as long as possible. This requires meticulous design. This is the blade that is pushing the design limits, and it must get the full treatment of long, low-pressure blading. As mentioned before, it is tapered with a high area ratio from the base to the tip and it also is twisted in order to control the steam flow in a vortex so that there will be minimum radial flow along the blade and no tendency for this flow to pile up at the tip of the blade. This 5½-in. blade at 12,000 r.p.m. will have a tip speed of 1,520 ft. per second. That is about the same as a 25-in. blade on a 50-in. drum introduced in the last few years for use in the largest 3,600-r.p.m. central-station turbines.

Blading at this speed requires careful consideration of resonance and vibration. The resonance problem on this blade is a little different than a 3,600-r.p.m. blade.

Author is chief engineer, turbine division, Elliott Co., Jeanette, Pa. Paper presented at the petroleum mechanical-engineering conference of the A.S.M.E. held in September 1954 at Los Angeles.

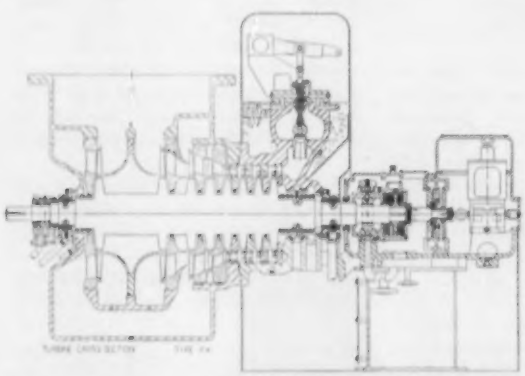


Fig. 1—High-speed, multistage turbine with double-flow exhaust system.

For 60-cycle turbines, the fundamental blade frequency is generally between the second and third multiple of running speed. But on a variable-speed compressor drive, the third multiple would excite the blade as soon as the compressor was slowed down. So the blade has to be stiffened to have a natural frequency high enough not to be excited dangerously by any running speed in the commonly wide speed range of compressors. This safe frequency is generally considered to be over the fourth multiple of running speed so that on slow-down, the lowest excitation will be the fifth multiple of running speed.

The natural frequency of the blade is calculated by established methods and is then carefully checked by tests to verify the calculations.

Fig. 2 illustrates a setup of this type. Strain gages are mounted near the base of the blade and the leads are taken through slip rings to an amplifier and an oscilloscope. The blade is then excited through a range of frequencies and the resonance points observed on the oscilloscope. For permanent record, the oscillograph takes a shot of film, complete with timing wave. The illustration pictured is of course a larger edition than the high-speed blade we are talking about here, but the problem is the same.

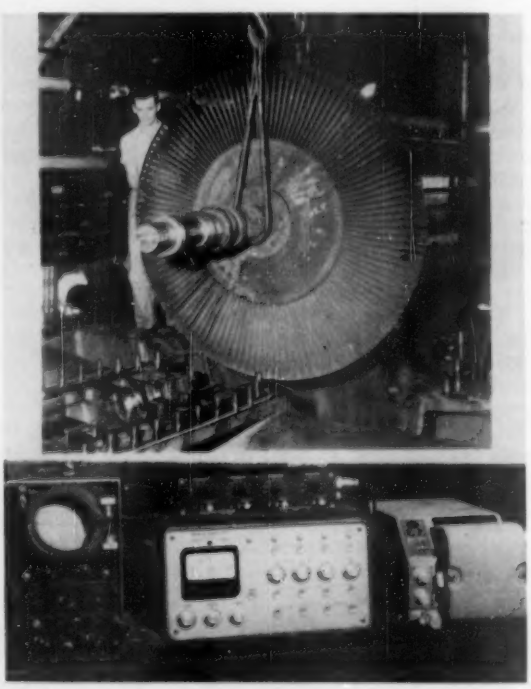


Fig. 2—Testing blade frequency through a setup that takes current through slip rings to amplifier and oscilloscope.

How a Difficult Control Problem Was Solved

by C. R. Miller

IN synthetic rubber plants with continuous polymerization, there is a process where several liquid streams are flow controlled into a system having twelve to twenty-four 3,750-gal. vessels in series. At the Baytown plant there are five such liquid streams and the outlet of the system is pressure controlled.

The related locations of the components on each of the flow controllers are (Fig. 1) a bellows-type pneumatic transmitter and orifice fitting located about 5 ft. from the control valve, and a recording receiver controller located some 200 ft. away.

Good control was obtained on all the streams but one. This stream, a dresinate soap solution, never controlled very well and would at times have adverse effects on the other four streams. Due to the properties of dresinate soap solution, it seemed a close-coupled loop with its fast responses would do a much better job.

To install a set-point station for such a loop meant a panel board revision. The possibility of using the present recording receiver controller as a set-point station was discussed (Fig. 2). We made inquiries and found no one who had tried such a loop, but we did find some who were interested in the results.

A stack controller as shown in Fig. 2 was installed. By alternating from automatic to manual on the receiver controller, a comparison could be made. On start-ups with the receiver controller on automatic, the flow would cycle completely across the chart with no indication of stability. By closing the pulsation damper one round, the flow would make about three decreasing swings before coming to the control point. Four rounds would close the pulsation damper completely. Once on the control point, it did as good a job as a conventional close-coupled loop.

The control settings on the stack were maximum throttling range and 15 to 20 repeats per minute reset rate as compared to 30 to 35 repeats per minute on conventional close-coupled control. We felt that we had gotten almost all the advantages of close-coupled control simply by adding a stack controller to existing equipment.

Author is with the government syr.thetic-rubber plant operated by General Tire & Rubber Co. at Baytown, Tex. Paper presented at Texas A. & M. Instrumentation Symposium, January 25-28, 1955.

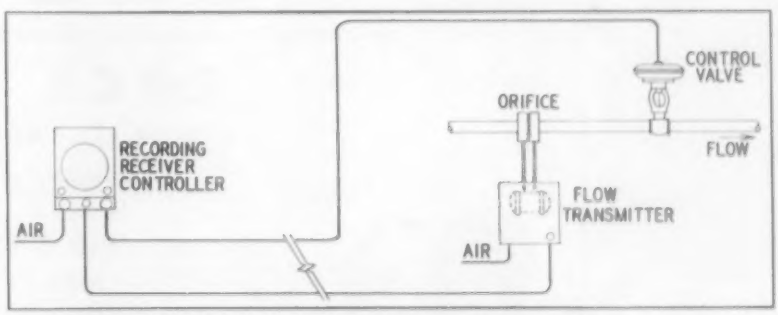


Fig. 1—This was the original system used for flow control of several liquid streams in a synthetic rubber plant. One stream, a dresinate soap solution, did not control well with this setup.

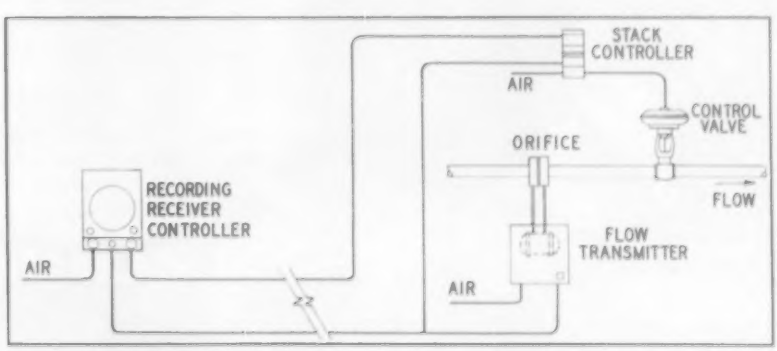
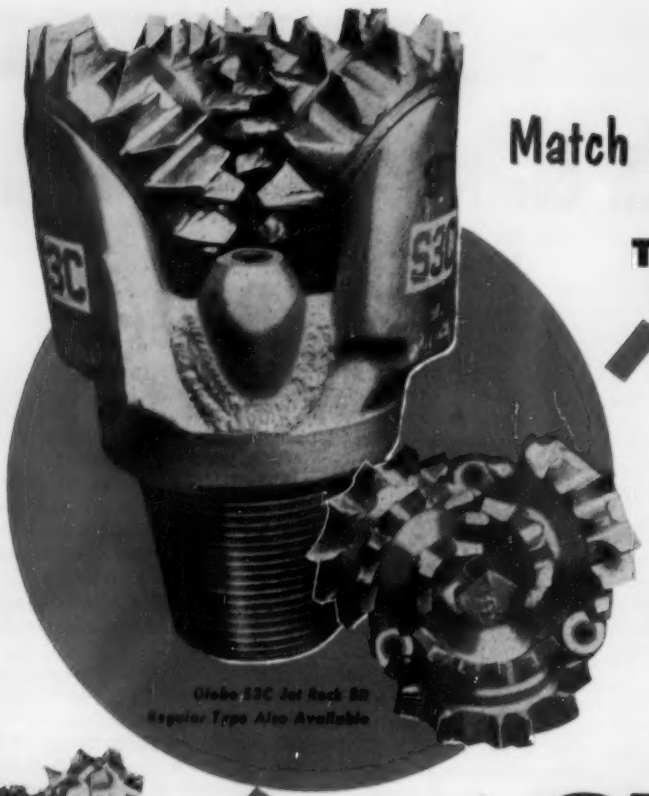


Fig. 2—The modified control system above includes the addition of a stack controller. The original recording receiver controller was then used as a set-point station.



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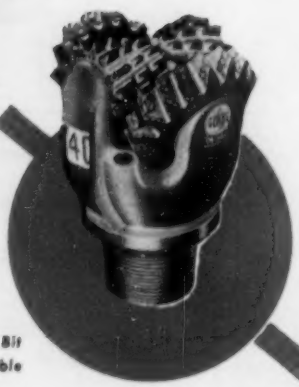

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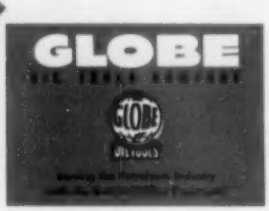

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Among the Drilling Contractors

Tyler Contractor Active In South Malakoff Area

Delta Drilling Co., Tyler, Tex., is undertaking another Travis Peak exploratory test in the vicinity of Malakoff South field, 3 miles west of Athens, in Henderson County, East Texas. The prospective pay zone is around 8,900 ft.

The test, being drilled for the company's own account, is in an area in which three Travis Peak, one Paluxy, and several Woodbine dry holes have been drilled.

In the meantime, the company is continuing development in the field, where oil production is found in the Glen Rose-Rodessa zone around 7,500 ft. Delta has just completed its tenth oil well, 1 Crabtree, and is starting another, 2-B Foster, located in the north part of the field.

The company reports a new contract operation being started in the Camp Fannin area, of Smith County, also in East Texas. Drilling is for L. A. Grelling, of Tyler. The test is 1 Atwood.

New Illinois Drilling Firm

V. S. & S. Drilling Co. is a newly formed rotary-drilling organization in the Illinois basin area. Principal owners are Arnold Valter, and A. R. and Milton Smith, of Flora, Ill. Dwight Beckham, of Edinburg, Ill., is tool pusher. Company headquarters are at Springfield.

J. C. Means, Beaumont, Tex., will do the drilling on a wildcat test Falcon Seaboard Drilling Co., Houston and Tulsa, is undertaking for its own account in Calcasieu Lake, Cameron Parish, Coastal Louisiana. Location is on State Lease 2263, in Tract 5261. Hole is projected to 9,250 ft.

Clinch Drilling Co., Jackson, Miss., has a new operation under way for Serio-Punches Oil Co., of Natchez, at a wildcat location in the Sibley area, of Adams County, Mississippi. It is a Wilcox test, scheduled for a depth of approximately 6,750 ft. Location is listed as 1 Glennon, in 13-5n-2w.

Jett Drilling Co., Shreveport, is putting down a projected 6,900-ft. test 1 mile northeast of Flat Rock, in Franklin County, Mississippi. It is a contract job for David K. Brooks and others at 1 Newman, in 19-5n-1e. Jett also is scheduled for two Wilcox exploratory tests in the Hiram area, of southwestern Wilkinson County to be drilled in partnership with Calto Oil Co. Locations are listed as 1-C and 2-C Crosby, the first in 28-3n-1e, 2½ miles south of town, and the second in 21-3n-1e, ¾ mile south of town. Objective is expected around 7,500 ft.

Deckard Drilling Co. is contractor on a new Eutaw well R. Merrill Harris is starting at Heidelberg, in Jasper County, eastern Mississippi. Location is at 1 Kirbyand Rowell, in 10-1n-12e. Pay is around 5,000 ft. in depth.

H. L. Rowley, Inc., Shreveport, has a rig contracted to Hellenic Oil & Gas Co. and Southern Production Co. for another 6,700-ft. Wilcox well at Overton, in Adams County, Mississippi. Location is for 4-C Overton Hills, in 22-5n-3w.

J. E. Hillier is contractor on a 3,000-ft. wildcat test 2 miles north of Poth, in Wilson County, Texas. Contract is with Miller & Pierce. Location is at 1 Mikulka, in the Maria Juliana Hernandez Survey.

Clay Chiles has a rig working for Argo Oil Corp. at a wildcat location 12 miles northwest of Realitos, in Duval County, Southwest Texas. The test is Argo's 21-A John Bennett. Argo has another wildcat test under way in McMullen County, just north of Duval County, with **Stewart & Richardson** doing the drilling. The latter test is 1-R Edrington, located 12 miles west of Clegg.

Johnson Drilling & Service Co., Magnolia, Ark., is drilling for Sunray Oil Corp. at a wildcat location 1¾ miles northeast of Midway field, in northern Lafayette County, Arkansas. The test, 1 Nicholas, in 5-15s-23w, is about 2¼ miles east of Baker. Hole is projected to the Smackover formation around 6,600 ft.

Milton Crow, Inc., Shreveport, has a new contract operation under way 6½ miles southwest of Bradley, in southern Lafayette County, Arkansas. It is a 6,800-ft. Pettit test for Latex Oil & Gas Corp., Inc., also of Shreveport. Location, at 1 Sorrell-Searcy, in 1-20s-

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26w, is 1¼ miles east of production in Kiblah field.

Delta Gulf Drilling Co., Tyler, Tex., has three new contract operations on schedule in South Louisiana. One is a 11,300-ft. test for Union Producing Co. at 1 Claire, in 39-13s-16e, about 3,800 ft. northeast of production in the College Point area, St. James Parish. Another is for Columbian Carbon Co. at West Gueydan, Vermilion Parish. This will be a 11,500-ft. test, 1 Vermilion Irrigation, in 32-11s-2w, on the north flank of the field. The third well will be a deep test for Humble Oil & Refining Co. at Pelican Island, in Jefferson Parish. Rig is coming from Humble's recently completed oil-discovery well in the Caminada Pass area, offshore from Jefferson Parish.

H. B. Stuckey Drilling Co. is contractor on a new wildcat test northwest of Waldron, in Scott County, in West Central Arkansas. Operators are F. R. Jackson and John C. Robbins. Location is for 1 Cabe, in 19-3n-29w. Hole objective is around 3,100 ft.

Fryer & Hanson Drilling Co., Dallas, is drilling for Magnolia Petroleum Co. at a wildcat location 1½ miles southeast of Cairo, in Houston County, southeastern Texas. Location is a 1 Spence, in the John Box Survey.

Trechell Contracting Co. has a rig working on a new wildcat operation 3 miles east of Wheeling, in Winn Parish, Central Louisiana. It is a contract job for Roy Martin and others at 1 Lang, in 21-9n-4w. Hole will be carried to the Wilcox.

Casey & Montgomery will drill two more wells for King Petroleum Co. in the Fruitvale area, west of Bakersfield, in Kern County, California. New locations are for 3-B KCL, in 11-29-27, and 1 King-Hill, in 28-29-27.

K. L. Kellogg & Sons, Compton, Calif., is drilling on a deep exploratory test in old Midway-Sunset field, in southwestern Kern County, California. The test, for Oceanic Oil Co., will be carried to the Eocene with a planned depth of at least 12,500 ft., possibly 15,000 ft. Deepest tests in the field so far have gone only into the top of the lower Miocene. Location, at D-3-7 CWOD, in 7-32-33, is 2 miles south of Fellows.

Creekmore Drilling Co., Tulsa, is drilling for Plains Exploration Co. at a wildcat location 2 miles southwest of Pinneo, in Morgan County, Colorado. Location is at 1 Krehmeyer, in 19-2n-55w.

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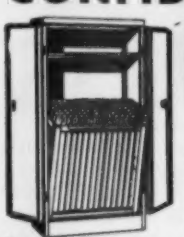

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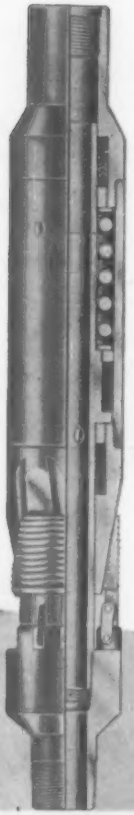

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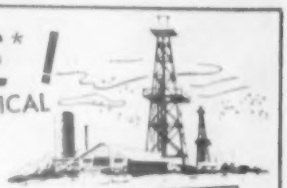

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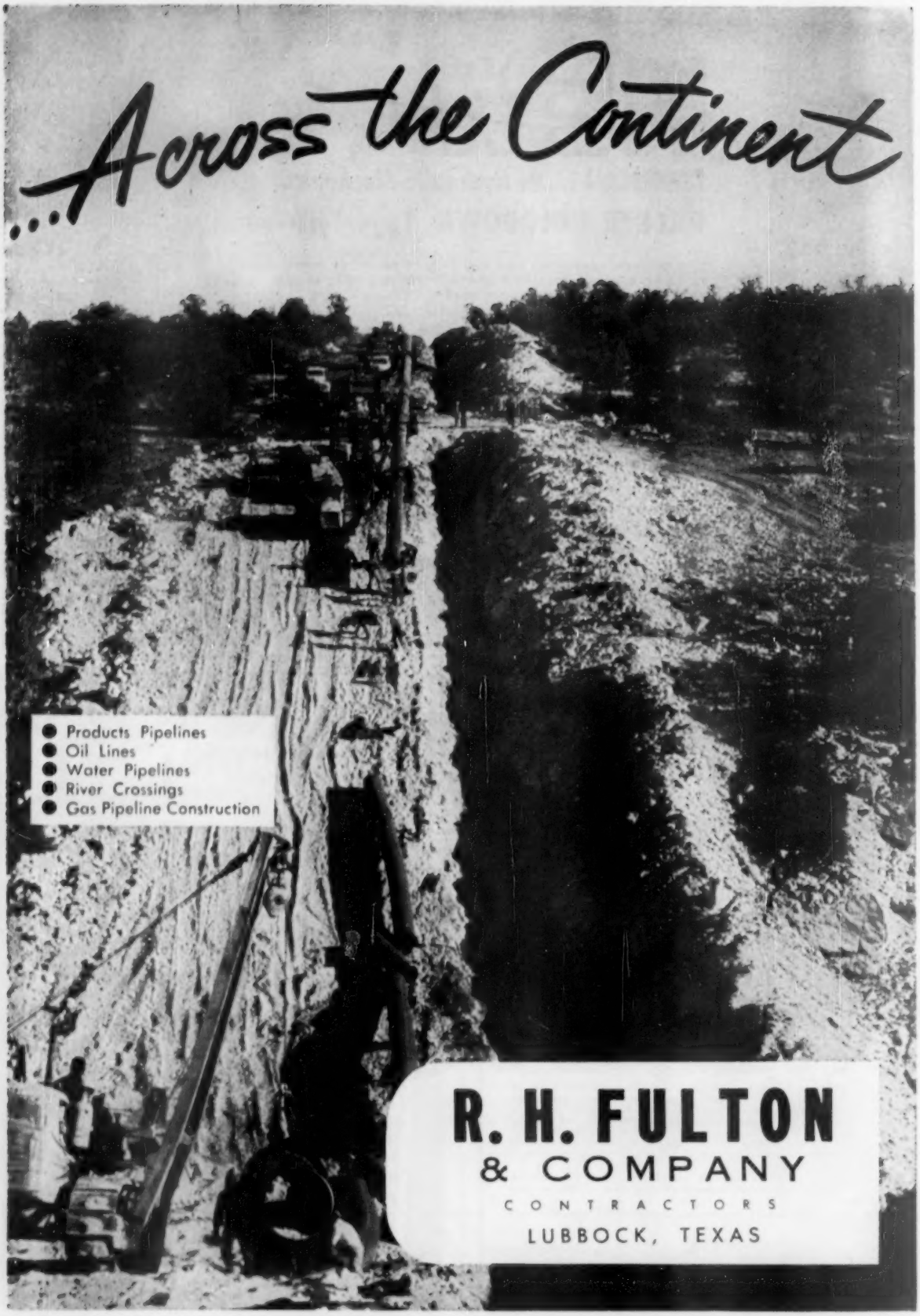
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Newly Elected Officers of Pipe Line Contractors Association

Pipe Line Contractors Association recently elected its officers for the 1955-56 term at the Los Angeles convention. They are, bottom row left to right, G. Austin Manuel, Williams-Austin Co., Pittsburgh, retiring president; John H. Williams, Williams Brothers Co., Tulsa, treasurer; Harold C. Price, H. C. Price Co., Bartlesville, Okla., president; C. C. Bledsoe, Midwestern Constructors, Inc., Tulsa, vice president; Earl Allen, Associated Pipe Line Contractors, Inc., Houston, vice president; and Richard A. Gump, Dallas, executive secretary. Directors are, top row left to right, R. L. Richards, Rosson-Richards Companies, Houston; N. K. McFarland, Lone Star Constructors, Dallas; Ray L. Smith, Jr., Ray L. Smith & Son, Inc., El Dorado, Kans.; R. A. Conyes, R. A. Conyes Construction Co., San Pablo, Calif.; R. P. Gregory, Houston Contracting Co., Houston; and James P. Neill, Western Pipe Line Constructors, Inc., Austin, Tex.

Under Way, Contracted, and Planned

PIPELINE activity as reported below by the Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by • preceding the job.

Crude-Oil Pipelines

Ar-Mex Pipe Line Co.—Company has applications for two lines before the Office of Defense Mobilization Board for rapid amortization approval.

1. A crude-oil line from Albuquerque, N. M., to Phoenix, Ariz. This line would serve a 20,000-bbl. refinery being planned by Frost & Associates of Dallas.

2. A crude-oil line from Guernsey, Wyo., to Albuquerque.

Magnolia Petroleum Co—This company will operate a 48-mile, 12-in. submarine pipeline for itself and Continental Oil Co., and Newmont Oil Co. The line will run to blocks off the coast of St. Mary's Parish, Louisiana, and will have a capacity of 50,000 bbl. per day. Brown & Root, Houston, has the contract and expects to be finished by the middle of 1955.

Minnesota Pipe Line Co.—Williams Brothers Co. has contract to build this 260-mile, 16-in. crude line from Clearbrook to Hastings, Minn. The line, to cost $12,500,000, is the southern end of a system which will move crude from Fosterton field, Sask., to Great Northern's refinery which is building in the Minneapolis-St. Paul area. Present plans call for completion by July 1955.

Standard Pipe Line Co.—Company plans to build two crude lines. Applications are now before the Office of Defense Mobilization for rapid amortization approval.

1. A 350-mile, 16-in. crude line from Glendive, Mont., to Guernsey, Wyo., to connect with Platte Pipe Line Co.'s system there.

2. A 330-mile, 16-in. crude line from Wink, Tex., to Albuquerque, N. M. This line would serve a 10,000-bbl. refinery being planned by Frost & Associates of Dallas.

• **Texaco-Cities Service Pipeline Co.**—Company has announced plans for an 8-in. 45-mile products pipeline from its West Tulsa refinery to Cushing, Okla. The company will also build a pump station at Tulsa and two 30,000-bbl. tanks at Cushing.

Texas New Mexico Pipe Line Co.—Firm has awarded contracts for 74 miles of crude lines in eastern New Mexico and West Texas. Ferguson Construction Co., of Eunice, N. M., will lay 43 miles of 8-in. from Maljamar station in Eddy County, New Mexico to Tulk pool in Lea County and Drickey pool in Chaves County, New Mexico. McVea & Barlow, Inc., Odessa, Tex., will lay 24 miles of 8 and 10-in. from Dora Roberts Ranch in Midland County, Texas, to Basin Pipe Line System's station at Midland, Tex.

Trans Mountain Pipe Line Co.—Engineers Limited Pipeline Co. has contract to lay 27 miles of 20-in. from Laurel to Burlington, Wash., and 9 miles of 16-in. of lateral to Shell Oil Co.'s new refinery at Anacortes,

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Wash. The $2,750,000 job will begin in spring and end in mid-summer.

• **Union Oil Co. of California.**—Planning construction of a 60-mile crude line from its Clara Valley field to its Wilmington refinery. 12-in. line. Bids being asked.

• **West Coast Pipeline Co.**—The off-again-on-again plans for this crude line from near Wink in West Texas to near Norwalk in California are presently before the Office of Defense Mobilization. A three-man board of nonindustry members recently recommended that the project be dropped. They questioned the ability of West Texas to produce enough crude to supply both the East and West Coasts in time of war. The three-man board favored building a line from California's Elk Hills Naval Reserve to be held in standby for possible future need.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

• **H. W. Bass & Sons, Inc.**—Company is planning on a 152-mile, 4-6-in. L.P.G. line from Goliad Corp.'s plant in Live Oak County, Texas, to Corpus Christi.

• **California - Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

Cimarron Valley Pipe Line Co.—Subsidiary of Chicago Corp. is building an 81-mile, 6-in. products line from Chamlin Refining Co.'s refinery at Enid, Okla., to Oklahoma City. River Construction Co., of Fort Worth, is doing the work.

Great Lakes Pipe Line Co.—Company has awarded contracts in two sections on its 163-mile, 10-in. line between El Dorado, Kans., and Kansas City, Mo. Ray L. Smith & Son, Inc., are laying a 91-mile spread between El Dorado and Burlingame, Kans. M-R Co., Wichita, is working on the remaining 72 miles into Kansas City.

• **International Pipe Line, Inc.**—132 miles 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

• **Keystone Pipe Line Co.**—Company has ODM writeoff of 25 per cent for $1,875,000, 48-mile, 8-in. products line from Boot, Pa., to the Fullerton, Pa., terminal.

Malco Pipeline, Inc.—Company planning to build a 91-mile, 6-in. products line from its Prewitt, N. M., refinery to Albuquerque.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive Mont., to Minot, N. D.

• **Products Pipe Line Co.**—This subsidiary of Goliad Corp. has received a fast writeoff for 40 per cent of $126,000 and 25 per cent on $1,781,000 for L.P.G. line from the Wilcox natural-gasoline plant in Lavaca County, Texas, to Texas City. Panama-Williams Co. has contract. Completion scheduled for mid-summer.

Shell Pipe Line Corp.—65 miles of 12-in. products line from Baton Rouge, La., to Shell's Norco refinery. Houston Contracting Co. has contract. H. T. Muckley, Supt. Job held up indefinitely by right-of-way difficulties.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport L.P.G. from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has asked FPC permission to abandon "Little Inch" gas line. If permission is granted, company will spend $71,000,000 converting the line to a products line with a capacity of 235,000 bbl. per day.

U. S. Gov't. Alaskan Products Pipe Line.—600 miles of 8-in. under way from Haines northward through Yukon to Fairbanks, Alaska. Williams Bros., McLaughlin, Inc., and Marwell Construction Co. are doing the work. Pipeline work completed.

Natural-Gas Pipelines

• **American-Louisiana Pipe Line Co.**—1,121 miles of 30 and 22-in., 30-in., proposed, extends from North Tepetate, Acadia Parish, Lousiana, to near Detroit. The 22-in. starts near Payne, Ohio, extends to Bridgman, Mich. Estimated cost: $130,000,000. FPC approved.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

• **Carolina Natural Gas Corp.**—185 miles 2-12-in., proposed later lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

• **City of Dalton, Ga.**—Proposes to build 39 miles of 8-in. from a point of interconnection with Southern Natural's Rome-Calhoun transmission line. Estimated cost: $2,940,000.

• **Colorado Interstate Gas Co.**—365 miles 22-in., approved by FPC, Green River, Wyo., to Denver, Colo., 1954.

• **Colorado-Western Pipe Line Co.**—454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service

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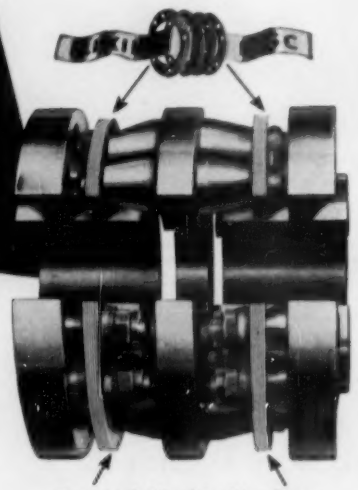

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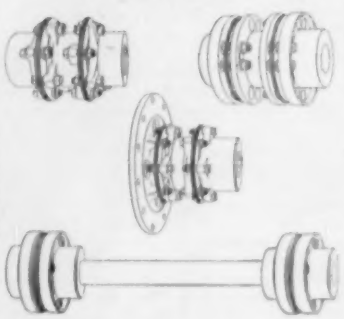

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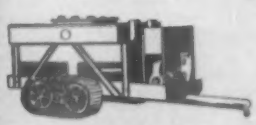
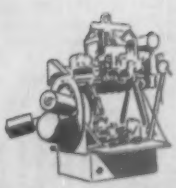


PIPELINE KETTLES



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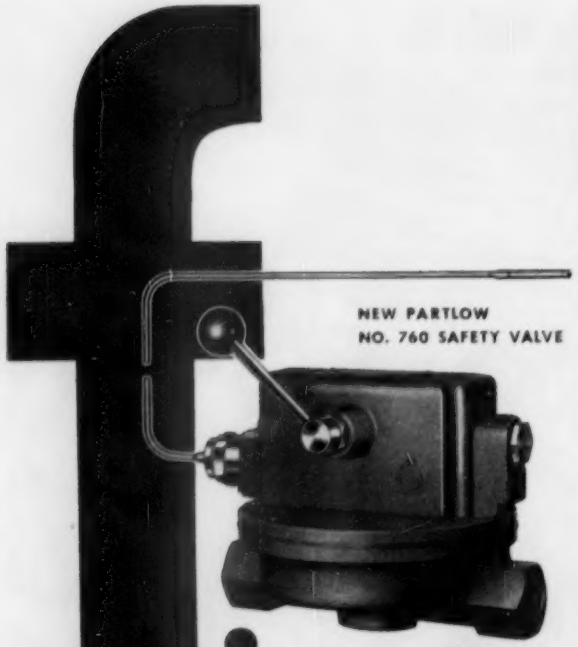

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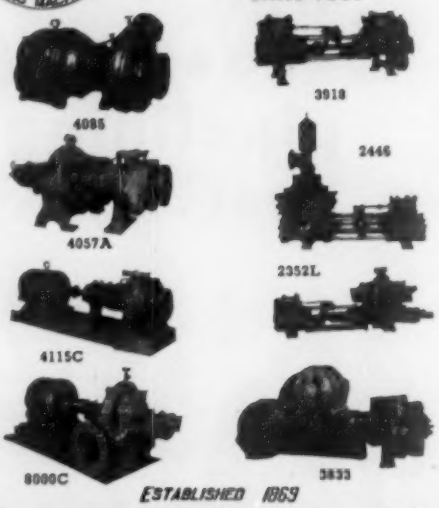

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Pipeline Patrol

Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

• **Hope Natural Gas Co.** — Proposing to build a 22½-mile extension of existing line from Boone County, West Virginia, to Logan-Mingo County line, West Virginia. Estimated cost: $930,000.

• **Houston Texas Gas & Oil Co.**—Company has proposed an 18-24-30-in. line from South Louisiana to Florida. Preliminary engineering, market surveys are completed. Early filing with FPC is anticipated by company.

Kansas Pipe Line Corp., Inc. — Company proposes to build 16-20-in. line to Wichita. Starting point for line has not yet been established. The line, which would have a capacity of 100 million cu. ft. daily may start in the Barber-Harper County area 100 miles southwest of Wichita, or it may be necessary for the company to go farther west to the Hugoton field. The line will cost approximately $5,000,000 and will be entirely intrastate.

• **Kansas-Nebraska Natural Gas Co., Inc.** —Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

72 miles, 16-20-in., Doddridge, Wetzel and Marshall counties, West Virginia. Fulghum Contracting Co. doing work.

• **Michigan Consolidated Gas Co.** — 25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo. FPC approved. Est. cost; $600,000.

• **Montana-Dakota Utilities Co.**—Proposes to build 56 miles of 2, 4, and 6-in. line from its 12-in. Cabin Creek - Bismarck line near Gladstone, N. D., to the towns of Lefor, Regent, New England, and Mott, N. D.

• Proposed 34½ miles of 12¾-in. line to run from Baker-Glendive field in Montana to Rapid City, S. D., and 14 miles of 12¾-in. to replace various lines in Park County, Wyoming, and Carbon County, Montana.

Natural Gas Pipe Line Co. of America.—Company has proposed a 280-mile line from Wise County, Texas, to Panhandle field in Texas where it would connect with the NGPLCA to Chicago.

• **Natural Gas Producers, Inc.**—This subsidiary of Colorado Interstate Gas Co. has applied to the Colorado Public Utilities Commission for permission to build a 48-mile, 10-in. pipeline to link Denver with northeastern Colorado gas fields. The company will also build 3 miles of 8-in. and 10 miles of 4-in. The entire project will cost $1,374,000.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **North Dakota Natural Gas Co.**—This company has moved back into the gas picture in North Dakota with a bid to build a 274-mile, $11,017,200 system from Tioga to Fargo to Grand Forks. An original application filed several months ago was complicated by a later application filed by Northern Natural Gas Co., to serve the same area.

• **Northern Indiana Fuel & Light Co.**—35 miles, 8-in., planned, Edgerton to Auburn, Ind.

Northern Natural Gas Co.—Company has just recently finished a large summer expansion. Still planned are:

170 miles of 20-24-in. line in Minnesota and Wisconsin running to Duluth and Superior.

400 miles of 24-in. line from the Canadian border to tie in with its system at St. Paul-Minneapolis.

500 miles of 24 or 30-in. planned across North Dakota from Tioga past Minot to Fargo and from there eastward to the Twin Cities.

• **Northwest Alabama Gas District.** — 40 miles, 9-in., proposed, Southern Natural's line through Winfield to Haleyville, Ala.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash. Approved by FPC.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

• **Pioneer Gas Co.**—R. H. Fulton is building 50 miles of 12-in. natural-gas line from fields in Goldsmith County, Texas to near Lubbock, Tex. Job expected to be finished in latter part of February.

• **Shenandoah Gas Co.**—40 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va. Est. cost: $1,470,000. FPC approved.

• **South Georgia Natural Gas Co.**—368 miles, 2-12-in., planned, Phenix City, Ala., to Tallahassee, Fla. (a) 12-in., Phenix City, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee. Est. cost: $9,000,000. FPC approved.

• **Southwest Alabama Gas District.**—150 miles, 10 and 8-in., planned, Phenix City to Dothan, Ala. Engineering Const. Co.

• **Tennessee Gas Transmission Co.**—Company has FPC authority to build 243-mile, 24-in. line from Hebron storage field in Potter County, Pennsylvania, to existing facilities near Greenwich, Conn. Company will also build an 18-mile connecting line between Hebron storage field and Harrison storage field.

• **Texas Eastern Transmission Corp.**—Proposed, 382-mile, 24-in. line from Kosciusko, Miss., to Beaumont, to connect with the existing 30-in. line there to Connellsville and replace the "Little Inch" in moving natural gas.

• **Texas Gas Corp.**—This firm will spend $3,500,000 on a line from Orange, Tex., to a connection with a new line of Transcontinental Gas Pipe Line Corp. in Cameron Parish, Louisiana. The project will call for crossing the Sabine River, building a compressor station, and a measurement station.

• **Transcontinental Gas Pipe Line Corp.**—Company has plans for 315 miles of 36-in., 231 miles of 30-in., 23 miles of 16-in., 23 miles of 12-in. from Trenton to Woodbury, N. J. 12 miles of 24-in. to connect with Tennessee Gas Transmission's system in New Jersey. The program will loop parts of Transco's present system and will cost $80,000,000. 173 miles of the 30 and 36-in. and the 58 miles of the 12 and 16-in. lines have already received FPC approval.

• **Utah Natural Gas Co.** — Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not yet let.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Westcoast Transmission Co., Ltd.—Company has signed agreement with Pacific Northwest Pipeline Corp. and has revived plans for its line from the Peace River area of Alberta to the United States border near Vancouver, B. C. Tentative plans call for work to begin sometime in 1955.

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Pipeline Patrol

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to build a 400-mile, 16-in. crude line from Plaza Huincul area to Bahio Blanca.

Bombay Port Trust.—50 miles, 8 to 24-in., contracted, Bombay, India, to serve Standard Vacuum Oil Co., and Burmah Shell refineries. Merritt, Chapman & Scott Corp., contractors. (Crude and Products). Collins Const. Co. has subbed 84,000 ft. of Subaqueous work. Shutdown for Monsoon season during summer. Work was resumed September 15.

Compania Shell De Venezuela.—Company will build a pipeline from its Block I field off the western shore of Lake Maracaibo to its terminal at Palmarejo. The line will be known as "Lapline" and will run 18 miles in the lake and 27 miles on land. The underwater section will be 16-in., and the remainder will be 24-in.

Peace River Oil Pipe Line Co., Ltd.—Company plans to build a 16-in. line connecting Sturgeon, South Sturgeon, and Little Smoky fields in Alberta to a planned 106-mile, 12-in. line which would move the crude south to Trans Mountain Pipe Line Co.'s Edson, Alta., station.

• **Petroleos Mexicanos.**—145 miles, 12-in. considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

Texas Petroleum Co.—Contract has been let to Foster Wheeler Corp. and Panama-Williams for a 119-mile, 12-in. crude line to move oil from Velasquez field in Colombia to a connection with the main Andian National system at Galan. Est. cost: $6,000,000.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Boliva.

Yacimientos Petroliferos Fiscales Bolivianos.—Bolivian Government oil organization has awarded contract to Williams Brothers, Sudamericana, Ltd., to construct a 6-in. crude line from Camiri field to Yacuiba on the Argentine border. The project will cost approximately $2,500,000.

Foreign Products Pipelines

• **Empresa Nacional del Petroleo.**—80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of South Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **National Fuel Oil Co.**—This company in Israel is a shareholder in a company which plans to build a products line between Haifa and Tel Aviv. The plans call for a 55-mile, 6-in. line in which the Government would own 10 per cent.

North Atlantic Treaty Organization (NATO).—1,920 miles, 4-10-in., to serve military bases in Western Europe (to connect with U. S. Government's St. Nazaire-Paris-Metz line). Contracted by Soc. Foster Wheeler Francaise.

Overland Pipeline Corp.—This South African firm has requested government permission to build a 350-mile line, to cost $8,450,000, from the South African coast to Rand, a plateau area in southern Transvaal where there is heavy petroleum consumption.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in. planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

• **United States Navy Department.**—Proposed 300-500-mile line to be built in Spain to serve a proposed naval base and four large air bases which are also proposed under a defense agreement with the Spanish Government. No definite size or cost is known now.

Winnipeg & Central Gas Co.—Canadian company plans to build a $20 million butane-propane system. Company plans to get gas L.P.G. from Signal Oil & Gas Co.'s Tioga, N. D., plant and move it to Winnipeg. Size and route of the line has not been definitely established.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering contracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd., for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

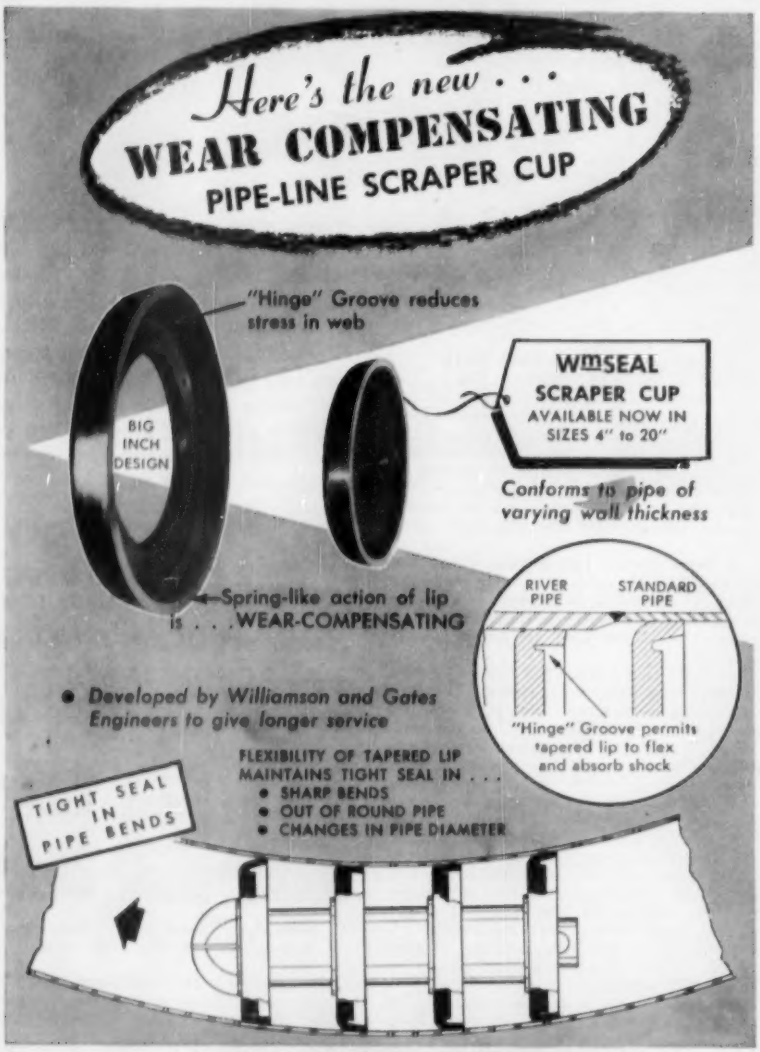
Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

• **Empresa Nacional del Petroleo.**—80 miles, 10-in., planned, Concon to Santiago, Chile.

Petroleos Mexicanos.—205 miles 16-in. under way, Monterrey to Torreon, Mexico.

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

Sui Gas Transmission Co., Ltd.—Morrison-Knudsen Construction Co. has contract to build 350-mile, 16-in. line from Sui field to Karachi in West Pakistan. Est. cost: $25,000,000.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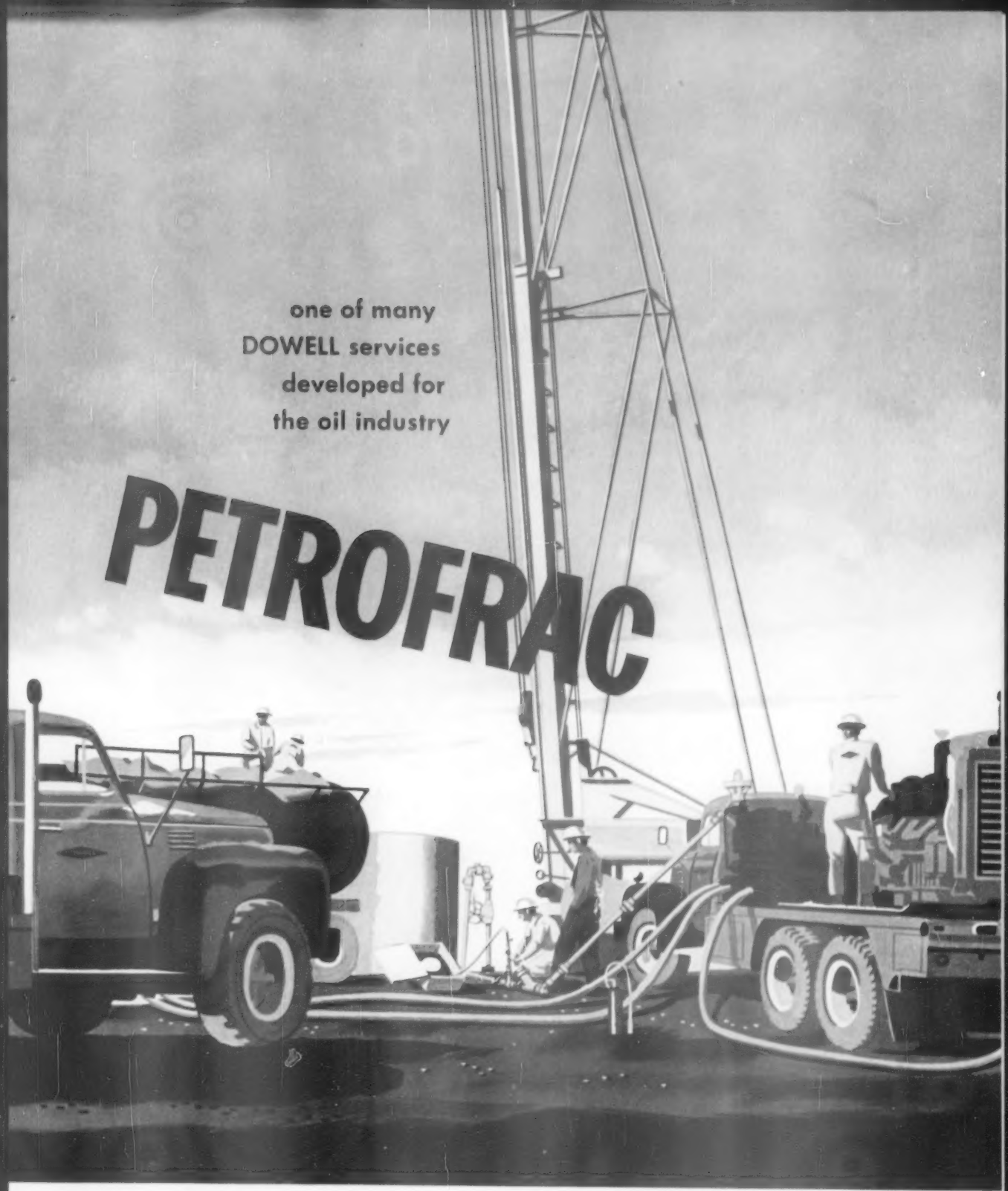

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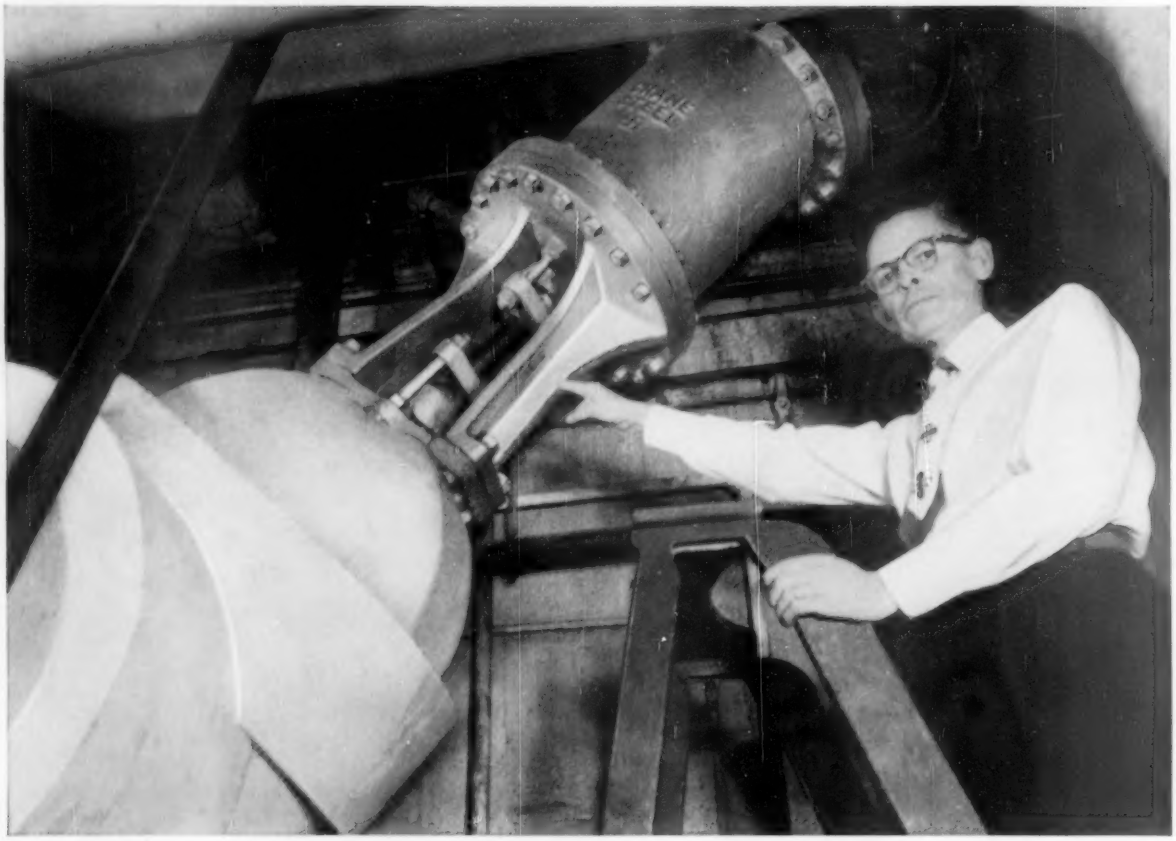

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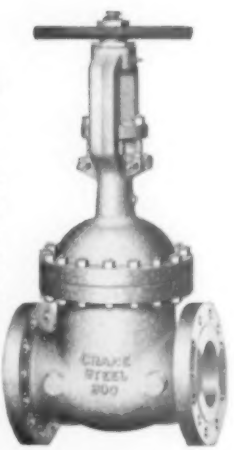

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. . . What's New in Equipment?

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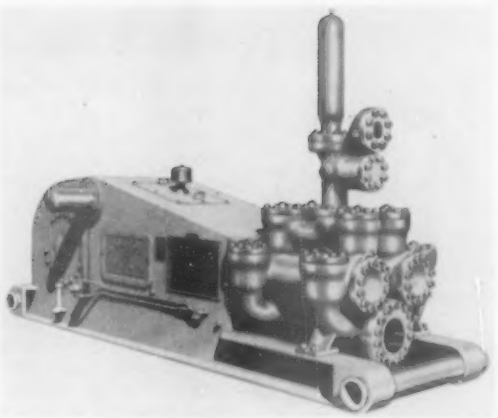
by Dan B. Miller



Mud Pump is Designed for Jet Drilling

Available now after more than 5 years of successful field tests, the new Ideco 600-hp. duplex 7¼ by 16 slush pump is specifically designed for the higher plunger loads required in modern jet drilling. The new pump is engineered for stamina to produce higher volumes continuously with lower maintenance costs. All-steel construction makes possible a high horsepower-to-weight ratio for ease in handling and setting up, and holds moving costs to a minimum. With expendables, less sheave, the Mud-Master weighs only 30,150 lb.

Extra-wide 16-in.-face herringbone gears permit low-unit pressure on gear teeth. Large 21-in. outside diameter double-tapered main and connecting-rod bearings are interchangeable. All radial clearances in the tapered roller bearings, races, and carrier elements have been removed to minimize impact loadings and eliminate bearing slap. High-strength crank-centric crankshaft and connecting rods are one-piece heat-treated steel castings.

The high-pressure fluid end is a normalized one-piece steel casting hydrostatically tested to 6,000 lb. psi. Smoother, fully streamlined passage contours, a sloped suction manifold, and large valve areas result in high-volumetric efficiency.

Weight reduction and increased strength and rigidity have been accomplished by integrating skids and frame into an all-steel Fabriform assembly, stress-relieved before machining. Repairs to the steel fluid end and other steel components can be made in the field.

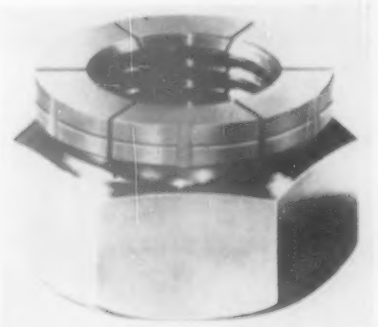
Power and fluid ends have separate and independent lubrication systems. A positive supply of oil at all operational speeds is provided in the power end by a simplified gravity system which directs a cascade of lubricant to all moving parts. Forced-feed lubrication from a rotary oil pump is delivered to all sides of the fluid piston rods at the point of wear through a screw-type packing gland. *Ideco, A Division of Dresser Equipment Co.*

Check No. 1 On The Time-Saver Card

●

Lock Nut Designed For Oil-Field Needs

A new lock nut has been designed to meet oil-field-operation demands for a fastener that will withstand the excessive tightening torques, heavy vibration and great stresses of drilling rigs, blowout preventers, and pumping equipment.



Primary advantage of the new eight-thread series is the helix of the thread which can secure high pressure without excessive wrenching, a vital requirement in the oil industry.

The all-metal, one-piece design permits the fastener to serve as a stop nut as well as a lock nut to provide this security. The new Flexloc comes in diameters ranging from 1 to 2 in., with intermediate sizes available at ⅛-in. intervals. It is available in alloy steel and, if needed, can be plated with zinc or cadmium. *Standard Pressed Steel Co.*

Check No. 2 On The Time-Saver Card

●

Torque-Flow Pump Easily Handles Solids, Slurries

Pumping of slurry has proved possible in test installations of a new kind of pump. This Wemco torque-flow sol-

ids pump is now available for use in a wide variety of industries. It can pump crushed ore, pulp, or ready-mixed concrete without binding on large chunks or suffering wear at an excessive rate. And it can pump waste material without clogging on rags, rope, string, and rubber.

The new torque-flow pump operates on a new materials-moving principle. Its impeller is similar to an automobile fluid drive, and though entirely out of the material flow pattern, it induces a swirl that does the pumping. The rotating fluid mass forms a buffer between the impeller and the solid particles and chunks in the flow, so that few of them ever touch. Under all conditions, impeller wear may be reduced as compared to conventionally designed pumps. There is no clogging because the interior of the pump offers no restriction to flow. *Western Machinery Co.*

Check No. 3 On The Time-Saver Card

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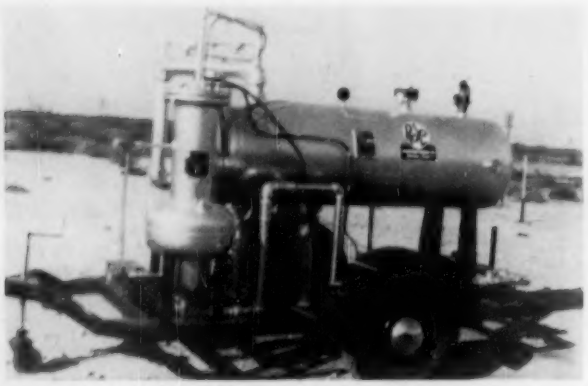

Wellchecker Operates Automatically

A new Wellchecker which will automatically separate, sample, meter, and accurately record for tax and royalty records the amount of oil, gas, and water from wells producing up to 1,000 bbl. per day liquid and 3,000 M.c.f. gas, has been added to the standard line.

Equipped with the new RM 1-18 Rolocheck oil meter and Rolo automatic liquid sampler, the new unit is known as Wellchecker No. 1H-2406-18. Crude from the well head is separated into three phases of oil, gas, and water in the Wellchecker. Oil flows from the separator into the Rolocheck meter, where it is accurately measured, and is automatically sampled while meter is dumping.

Connections are provided for free water knockout, using a RM 1-18 water meter (which has a weighted float). Equipped with 1½-in. oil lines and 3-in. gas run, the unit is completely piped, ready to operate. This new Wellchecker is mounted horizontally on a balanced trailer, and the entire unit weighs 1,800 lb. *Rolo Manufacturing Co.*

Check No. 4 On The Time-Saver Card

●

Idealarc Provides Choice Of Current and Force

Idealarc is a new, universal combination arc welder which provides a choice of either a.c. or d.c. welding current. The machine is said to provide an ideal type of welding arc for every type of manual welding application, permitting selection of either a soft or forceful arc.

The machine is available in several combinations. It can be obtained as an a.c. welder without the d.c. current. To this unit a d.c. package can be easily attached in about 1 hour, whenever desired. It is also available as a combination a.c. and d.c. machine, with selection of either current, made through a simple twist of a switch handle. Different output capacities of d.c. and a.c. can be combined to fit the machine to job requirements. The machine thus can be quickly set for maximum efficiency on every type of welding; ferrous or nonferrous materials, sheet metal or heavy plate, all positions, and

under arc blow conditions, or poor fitup.

Both voltage and amperage are controlled to give the desired control of arc characteristics. The Idealarc provides continuous current control through a rotating core in a separate control circuit and also has a switch to permit control of the open circuit voltage. Through this voltage control, the arc can be made to be either a soft arc, steady, low in spatter with a spray type of metal transfer, or it can be made a forceful digging arc with maximum penetration for crowding the arc without a tendency for electrode sticking. The Idealarc machine also has an arc-booster switch for selecting normal or hot starting. The machine's inherent stability provides unusually good a.c. current starting characteristics, but the switch permits controlling this to give efficient performance on different types of materials, in varying thickness, and under different joint conditions. *Lincoln Electric Co.*

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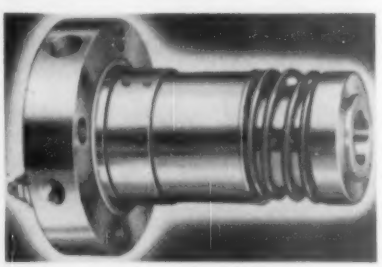

New Mechanical Seal Takes Temperatures Up to 800° F.

A new high-temperature mechanical seal is designed and tested to handle the rugged requirements of refinery service, including hot-asphalt and hot-oil pumping up to temperatures of 800° F.

This seal requires no cold-oil injection and it needs no auxiliary pumping

for coolant. It is an all-metal precision seal with no gaskets other than the shaft sleeve to the shaft and a seal cover to the stuffing box. It is completely corrosion resistant.

This mechanical seal is currently in use in a number of refinery and other high-temperature installations and has proved to be a reliable, safe, and effective answer to shaft sealing in both high-temperature and corrosive pumping service.

The new high-temperature seals are available in size and for any pressure encountered in refinery operation. *Byron Jackson Co.*

Check No. 6 On The Time-Saver Card

●

Hand-Driven Centrifuge Features Light Metals

A new model, hand-driven centrifuge for determining basic sediment and water in crude oil, known as Series 53, incorporates new improvements and features over earlier models, one of which is a weight reduction of approximately one-third gained through the use of aluminum castings.

The new Series 53 model has shipping weight of slightly under 7 lb. The new machine meets a need of gagers for a lightweight, ruggedly constructed, heavy-duty type machine for field use; simple in design and requiring no special care for continuous service. Crank spindle, nut, and guard are identical on both cubic centimeter and 100 cc. models; so user may have the advantage of two machines in one, just by changing heads. Spindle nut, for retaining head on shaft, has left-hand thread to prevent danger of backing off when machine is in use. Drive shaft and pinion shaft are stainless steel. Diameter of drive shaft has been increased from 7/16 to ½ in. for added strength. Gears are bronze bushed. The gear ratio and throw of the crank

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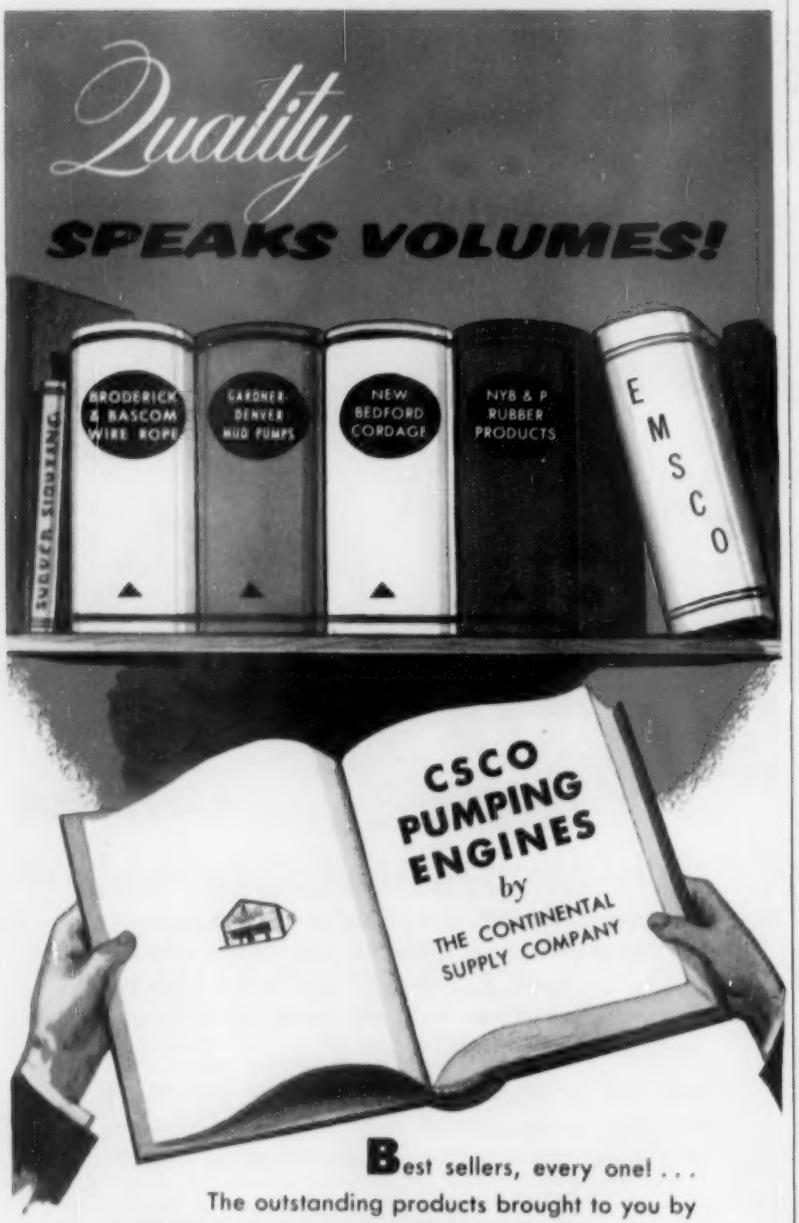

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produces required speed with least effort consistent with good mechanical construction. Spindle shaft has ball-bearing mounting, reducing friction for easier turning. *W. H. Curtin & Co.*

Check No. 7 On The Time-Saver Card

●

Portable Gas-Sampling Unit Makes Measurement Simple

A new portable gas-sampling unit, Model Y-101, provides a compact system for bringing sample gas streams to an analyzer for measurement.

It consists of a sturdy motor-driven pump, filter, flow indicator, valves, and a 20-ft. power cord, all mounted and interconnected in an aluminum case. The unit may be easily attached to Model C2P oxygen analyzer or can be supplied with a handle for independent operation.

No special skill is needed to operate Model Y-101 sampling unit. The line from the stream to be analyzed is connected to the intake part of the unit. The pump operates on 115 volt a.c. *Arnold O. Beckman, Inc.*

Check No. 8 On The Time-Saver Card

●

Pump Body Is Ideal for Oil, Gas-Well Servicing

This new high-pressure fluid-pump body is suited for hydraulic fracturing, chemical acidizing, and cementing of oil and gas wells. Made of forged steel, it has greater strength and a greater safety factor. It increases production and holds rig time to a minimum. Made in three sizes, Models 306, 406 and 458 to fit Wilson-Snyder pumps, and Types 36, 46, and 48, or it can be built by specification to fit any existing pump. This pump body is made of A.I.S.I. 4140 annealed forged steel, and is proven to pressures of 10,000 psi.

It contains lower and top valves in

*

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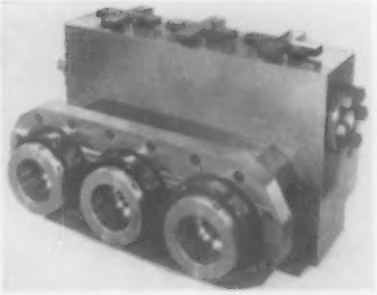

line with plungers for suction and discharge. All valve closures have special handle-type covers that provide extra rigidity. It is made with or without removable discharge connection. A screw-type packing glad in brass is available on all models. *20th Century Manufacturing & Supply Co.*

Check No. 9 On The Time-Saver Card

●

Safety Switch Cuts Out Engine If Pressure Drops

The 0-20 series Murphy safety switch will automatically shut down an engine if the oil line breaks or if, for any reason, the oil pressure drops. Rugged in construction, the few moving parts are made of monel, nickel silver, stainless steel, or phosphor bronze. This switch will stand over-pressure four times the scale reading without disturbing the accuracy or calibration. The exclusive automatic lockout push button releases when the engine starts. No external switch is necessary.

Models are available for panel mounting or direct mounting on single magneto ignition, multiple magneto, battery ignition or diesel engines. The 0-20 is easy to install, and all action is visible. It is available in pressure ranges 0-12, 0-30, 0-75, 0-160, and 0-300 psi. *Frank W. Murphy—Manufacturer.*

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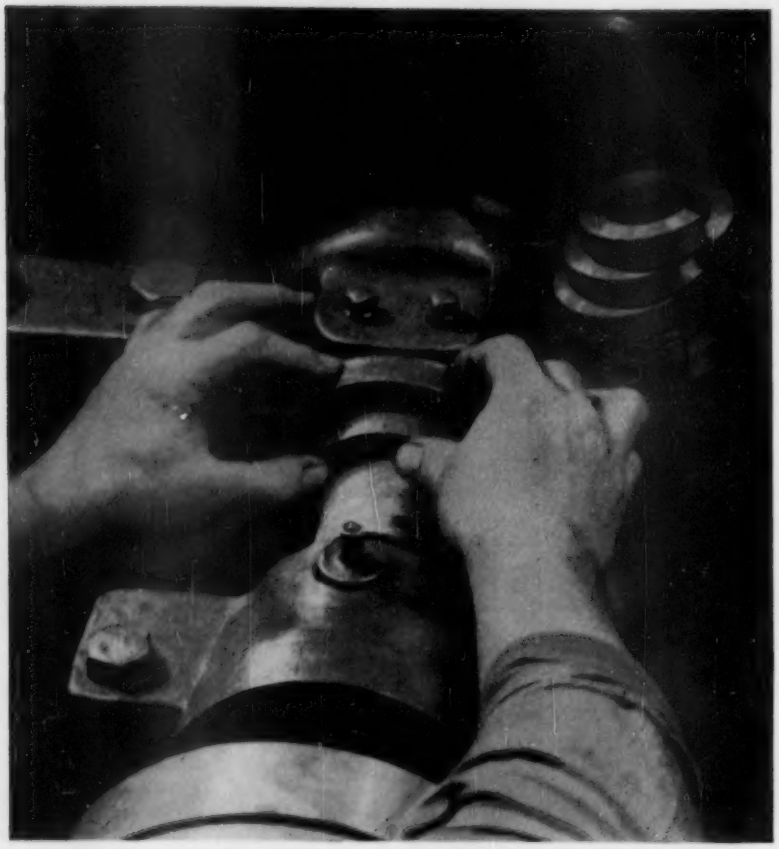

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Oil men everywhere are learning that R/M Universal Plastic Packings enable them to schedule their maintenance—rather than have it forced upon them. They are learning also that these packings lower maintenance costs and lengthen equipment life. How do we explain it?

Superior Lubrication. *The lubricants in these packings are all through the compound—locked in so securely that even after wear sets in, the effectiveness of their bearing surfaces remains unchanged.*

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- Bulletins
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Analysis of Light-Hydrocarbon Gases. A newly released 12-page booklet describes Fracton, a new instrument now being introduced for the analysis of light-hydrocarbon gases. Fully explained is the Fracton method of adsorption fractionation. Line drawings, including a detailed flow diagram, and photographs of accessory equipment illumine the text. Featured is high speed of analysis. Almost completely automatic, the Fracton method offers users accuracy and reproducibility with all analytical procedures easy to standardize. *Burrell Corp.*

Check No. 11 On The Time-Saver Card

●

Aluminum in the Process Industries. The growing applications of aluminum in the process industries are described in a new eight-page booklet. The brochure outlines the economic and technical advantages of aluminum used in processing equipment for chemical and material storage, and for transporting liquids. A digest of the applications of the light metal in the process industries opens the booklet, foilowed by descriptions of the aluminum products involved. These include: heat-exchanger tubes; Utilitube, an aluminum-coiled tube; Unitrace, an integral steam-traced piping; pipe and fittings; standard storage tanks; aluminum tank cars; shipping containers; bus bars; and general metal work. *Aluminum Co. of America.*

Check No. 12 On The Time-Saver Card

●

Everything in Safety, is the 1955 catalog of personal protective equipment and industrial safety devices. This new catalog covers respiratory devices, eye protection, hats, gloves, carboy pumps, drum pumps, and miscellaneous industrial safety equipment and many unusual safety specialties. *General Scientific Equipment Co.*

Check No. 13 On The Time-Saver Card

●

International Power Units. Eighteen heavy-duty power units are described in a new catalog. The 18 heavy-duty engines have a range of from 16.5 to 200 net hp. They fall into three groups:

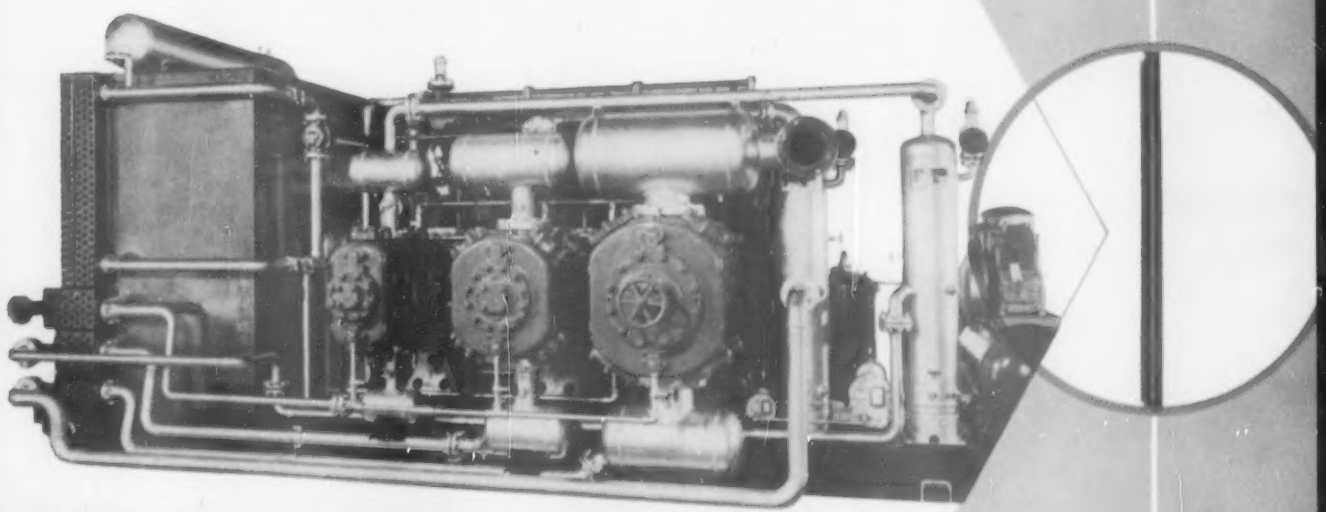
Southwest

PACKAGED COMPRESSOR PLANTS

Cooper-Bessemer

GMXA V-Angle Gas Engine-Driven Compressor

ESSENTIAL FOR GAS LIFT



Every gas lift installation is engineered specifically for one particular well. Every Southwest Packaged Compressor Plant is likewise individually engineered. Southwest power brings the long life and low maintenance of an integral, complete compressor plant to the well head. The rugged design and low RPM of the Cooper-Bessemer GMXA V-Angle Gas Engine-Driven Compressor means you'll keep on producing without losses from repairs, replacing belts, etc. Each Southwest plant is complete and ready to go weeks ahead of conventional units. Available in sizes from 200 horsepower.

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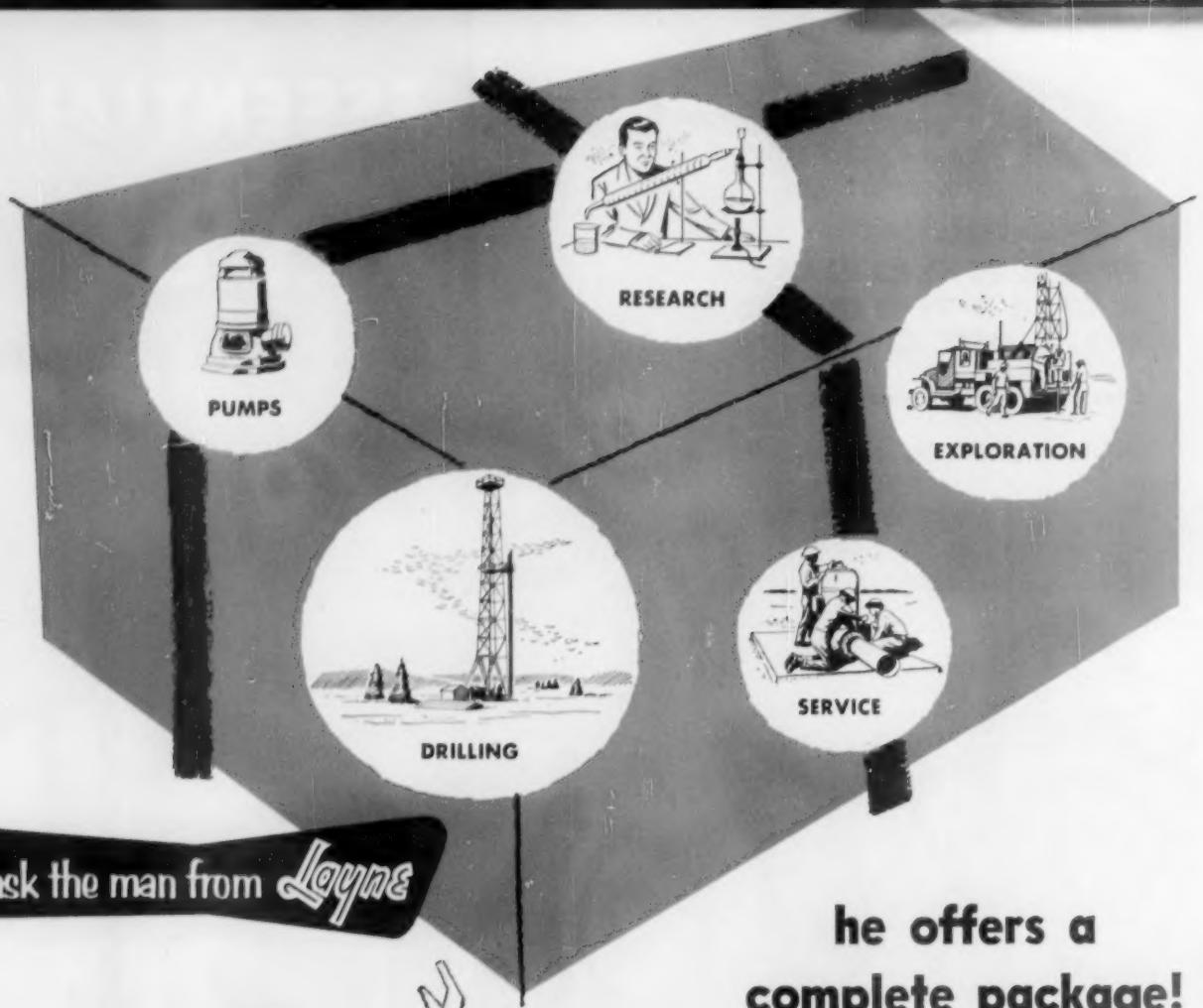

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four-cylinder carbureted units, six-cylinder carbureted units, and diesel units, both four and six cylinder. The catalog lists six heavy-duty diesel power units, from 55 to 190 hp. There is a choice of seven six-cylinder heavy-duty carbureted units, from the model U-220 with 62 hp. up to the big model U-1091 with 200 hp. The five four-cylinder carbureted engines range from 16.5 to 55 hp. *International Harvester Co.*

Check No. 14 On The Time-Saver Card

●

A Great Hand to Help You Cut Costs. A new picture bulletin G-15 carries a listing of products bearing the P&H name. The booklet is streamlined with essential facts and capacities on P&H overhead cranes, electric and chain hoists, arc welders, welding electrodes, welding positioners, truck cranes, power shovels, electric shovels, soil stabilizers, and diesel engines. The bulletin includes a large-size map showing locations of P&H plants, branches, warehouses, and parts depots, sales offices, and dealers. *Harnischfeger Corp.*

Check No. 15 On The Time-Saver Card

●

Power for Progress. A new brochure describes the operation of General Motors 6-110 diesel engines and illustrates industrial and marine models in the series from 200 to 575 hp. ready for distribution by Detroit Diesel Engine Division distributors and dealers. The brochure covers features of design, specifications, and power curves of single, multiple-engine, and torque-converter units, and includes photos of these engines at work in various types of equipment. *Detroit Diesel Engine Division, General Motors Corp.*

Check No. 16 On The Time-Saver Card

●

National Type D Casing Head. Bulletin 433 features the Type D casing heads for suspending and independently sealing single casing strings weighing up to 200,000 lb. *National Supply Co.*

Check No. 17 On The Time-Saver Card

●

New Ball Float Trap Bulletin. An eight-page bulletin No. 289 describes ball float traps for draining water from air, gas, or steam lines or for draining light liquids from gas under pressure. Physical data and prices are given for cast semisteel and forged-steel single-lever, snap action, compound-lever, and free-floating-lever traps. An orifice-capacity chart together with tables of maximum operating pressures on light liquids of various specific gravities enables the reader to select traps directly from the

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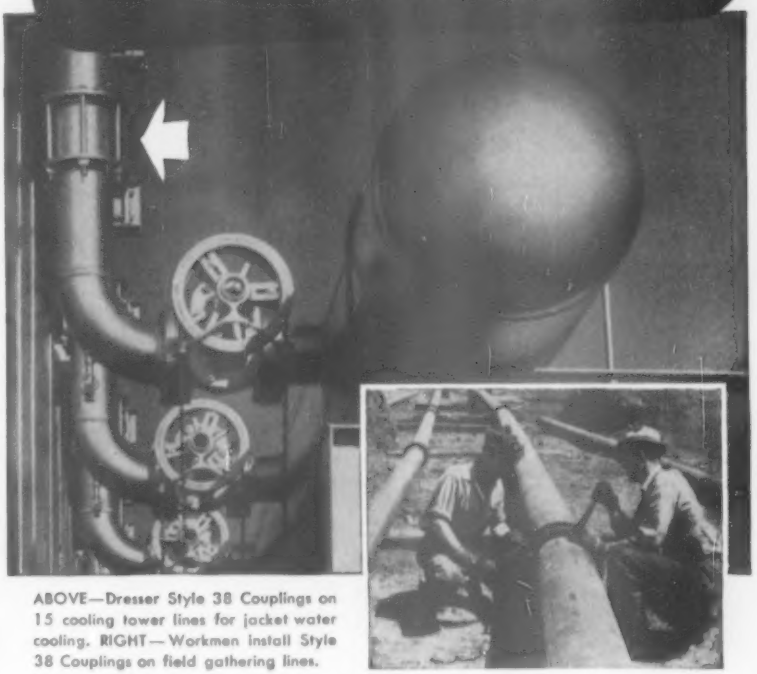


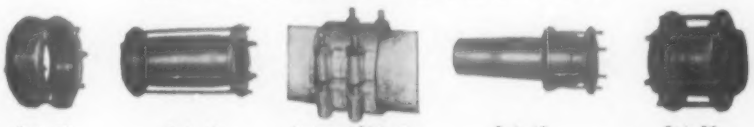
ABOVE—Dresser Style 38 Couplings on 15 cooling tower lines for jacket water cooling. RIGHT—Workmen install Style 38 Couplings on field gathering lines.

Anywhere you're joining pipe, the handiest, surest way to get bottle-tight joints is with Dresser Couplings or Long Sleeves.

Dresser Couplings provide the "give and take" necessary to absorb vibration, settlement and other stresses. Specially compounded rubber gaskets permit up to 4° deflection at joints—yet with Dresser Couplings, these joints stay permanently tight.

The only tool you need is a wrench—no pipe threading is necessary. Any workman can install Dresser Couplings, averaging only two man-minutes per bolt.

AVAILABLE AT LEADING OILFIELD SUPPLY STORES



Style 38 Coupling | Style 40 Long Sleeve | Hydrepair* Asbestos Cement Pipe Clamp | Style 63 Expansion Joint | Style 39 Insulating Coupling

*HYDREPAIR is a trade-mark of Dresser Manufacturing Division

DRESSER® COUPLINGS

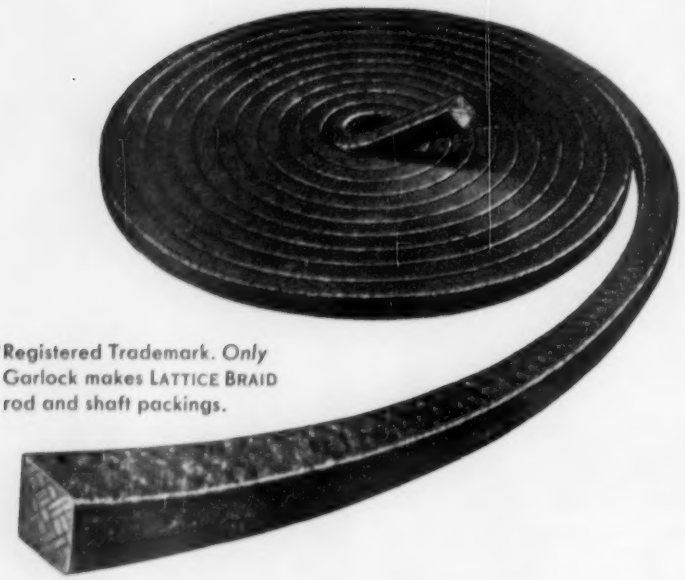
Dresser Manufacturing Division, 49 Fisher Ave., Bradford, Pa. (One of the Dresser Industries).
Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Airport Blvd., S. San Francisco, Calif.

Users report that

LATTICE BRAID*

ROD AND SHAFT PACKING

has these 5 advantages



*Registered Trademark. *Only* Garlock makes LATTICE BRAID rod and shaft packings.

1. Requires *less* gland pressure
2. Causes *less* sleeve and shaft wear
3. Retains lubrication *longer*
4. Does *not* unravel; thus makes better, more uniform rings
5. Lasts *much* longer than ordinary braided packings

Put Garlock LATTICE BRAID Packing to work for your company. All the braided strands of this unique packing are lattice linked together into one structural unit. The strands hold together even when the packing is worn far beyond the limits of wear of ordinary braided packings.

LATTICE BRAID is made from flax, cotton, asbestos, wire-inserted asbestos, Teflon, and asbestos with Teflon impregnation—for various types of services.

Get all the facts about LATTICE BRAID *Packings. Contact your Garlock representative or write for new folder AD-131.*

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N. Y.) • Philadelphia Pittsburgh • Portland (Oregon) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK LATTICE BRAID PACKING

bulletin. Installation diagrams are included. *Armstrong Machine Works.*

Check No. 18 On The Time-Saver Card

●

Master Engineering Manual on Multi-V-Drives. The new 100-page manual presents a scientific and simplified method for rating V-belts. Each 60-cycle motor speed with complete drive selections is shown on separate pages. A table on drive selections contains nearly every possible stock-sheave combination and each belt column in the table section has its own series of arc and length-correction factors. The use of a simple graph to find effective diameters eliminates the new D factor for sheave diameter and ratio and saves on multiplication steps. Service factors for proper duty classification are based on load requirements and hours of service. *Worthington Corp.*

Check No. 19 On The Time-Saver Card

●

Hillmac-Coldset Diamond Coring describes some new ideas in engineered diamond drilling. The multicolor brochure covers a complete line of diamond coring and drilling bits, and the reliable service offered by the firm. Services include outright sale, rental, engineering service, and contract coring. Of particular interest are cross-sections of bits showing the shark-tooth pattern and Coldset mounting of diamonds. *Hillmac Corp.*

Check No. 20 On The Time-Saver Card

●

Suspension Drilling Tool is a descriptive bulletin on a tool called Suspension Drilling Tool said to assure a straight hole and increase over-all rig efficiency in deep drilling. Reciprocating action of this drill collar allows full suspension of the drill pipe. *Bekco Oil Tool Co.*

Check No. 21 On The Time-Saver Card

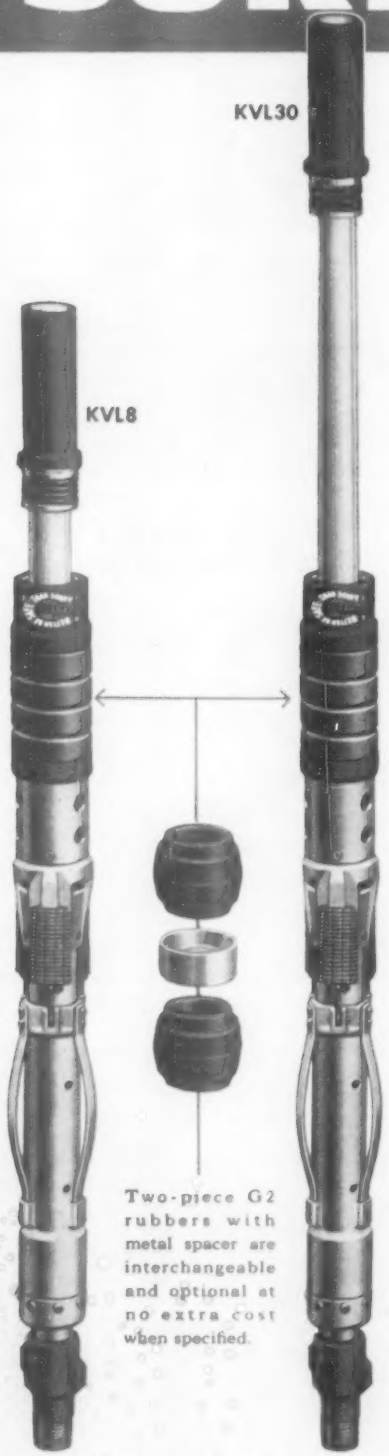
●

Forged-Steel Unions. Bulletin U-1 describes the company's new forged-steel unions. The unions are designed to the dimensional specifications of the Association of American Railroads and are drop-forged of highest-quality carbon steel in accordance with A.S.T.M. Specification A-105, Grade 2. The new bulletin presents complete dimensions of the unions in sizes ⅛ to 2 in., 3,000-lb. class. Outstanding design features which make the unions highly desirable for high-pressure service and for resistance to shock, vibration, and misalignment stresses are fully described. *Watson-Stillman Fittings Division, H. K. Porter Co., Inc.*

Check No. 22 On The Time-Saver Card

SAFE and SURE

GUIBERSON'S KVL PACKERS



With Automatic Latch

Operators who want extra assurance that a packer won't come unlatched going in, depend on Guiberson KVL packers. Rugged and durable, KVL packers have earned a reputation for dependable performance in deep and medium depth wells. These retrievable packers are easy to set and release, with ample bypass and positive seal. When running into a liner the KVL stays latched and drag springs provide an excellent guide — features operators like. For conserving gas energy and increasing production in flowing wells; for completing wells by circulation; for acidizing, repressuring and dozens of other uses, the KVL is unsurpassed.

- Made as the KVL30 with 30" valve stroke or KVL8 with 8" valve stroke for standard below-packer circulation. (Both packers also made with perforated mandrel for circulation above packer.) Available in casing sizes 5" through 9⅝".
- Valve has two independent sealing elements, a tapered metal valve and seat and a set of oil-resistant seal rings, affording double-sealed protection.
- Rubbers made of special oil and gas resistant compound. Will not vulcanize to casing — recover original shape when released.

THE GUIBERSON CORPORATION

ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

EQUIPMENT MEN . . . in the News

Hughes Names Two District Managers

Appointment of Wade W. Hampton as manager of southern region, and Marion A. Foreman, manager of Gulf Coast division, has been announced by

W. W. HAMPTON

M. A. FOREMAN

M. E. Montrose, vice president, sales, Hughes Tool Co.

Hampton has been associated with Hughes Tool for the past 36 years, and since 1945 has been manager of the Gulf Coast division. In his new position as manager of southern region, he succeeds Rolla L. Long, who died while on a business trip to Louisiana. In addition to sales, Hampton has had wide experience in manufacturing and service-plant operation. He spent 8 years in California and prior to joining the sales department, was plant manager of the Houston plant.

Foreman, who now heads the Gulf Coast division, has been with Hughes sales organization since 1937, starting in field service. In 1946 he was named manager of the Texas-Gulf Coast district, a position he held until his recent promotion.

Tube-Kote Starts Technical Meetings for Field Men

Tube-Kote, Inc., Houston plastics company, has inaugurated a series of bimonthly technical meetings for key field personnel.

In Midland, Tex., recently Tube-Kote sales engineers and Larry E. Heinen, president of the company, held the first meeting in the Permian Basin area. The next meeting, to be held some time in February, will offer similar group discussion for solving technical problems in another oil-producing area.

Heinen stated that the purpose of these meetings is to provide field engineers with group thinking on technical problems, and that any company with pipe-corrosion or paraffin-deposition problems can now obtain the combined help of a number of qualified Tube-Kote engineers having specific experience in the field.

Coupled with its new bimonthly field meetings, Tube-Kote will soon publish technical bulletins on plastic linings for steel pipe and plastic pipe, explaining uses and applications in the oil-field industry. Case histories are scheduled to appear as well as technical data.

Weatherford Makes Yates Eastern Division Manager

R. C. YATES

Weatherford Oil Tool Co., Inc., has announced the promotion of Robert Calvin (Bob) Yates to manager of its eastern division at Harvey, La. He succeeds Henry Lee Martin, now general manager of national sales and distribution for Weatherford at Houston.

In making the announcement, company officials said the division office was moved to Harvey from Nocona, Tex., in the interest of providing more effective service to its customers in East Texas, Louisiana, Arkansas, and Mississippi.

Yates, a field man with the company since 1953, moves up from assistant division manager. Receiving his early oil-field training in Illinois, he was a toolpusher in West Texas when he joined Weatherford's sales-and-service team at Abilene, Tex., as a district manager. Most of his service with the company has been in Louisiana.

Chester To Manage New Maloney-Crawford Office

Maloney - Crawford Tank & Manufacturing Co., Tulsa, has opened up a new district sales office at Denver, with L. R. Chester in charge as district manager. Stocks of tanks, treaters, and separators will also be maintained at Brush, Colo.

Chester has been with Maloney-Crawford for 5 years and formerly represented the firm at Oklahoma City.

Harrison Made Operating Manager, United Chemical

R. C. HARRISON

The appointment of Roy C. Harrison as operating manager of United Chemical Corp. of New Mexico has been announced by Marvin Gammill, president of the corporation. Harrison was associated with Gulf Oil Corp. before his transfer to United Chemical in 1954. In 1950 he was transferred from Gulf's gypsy division to the engineering division at Hobbs, N. M., where he was located until his resignation.

United Chemical specializes in producing water-treating chemicals for oil-field and industrial use.

H. C. Smith Appoints Swart Chief Product Engineer

Ken Swart has been appointed chief product engineer for H. C. Smith Oil Tool Co. Swart was associated with the engineering department of Security Engineering Division, Dresser Industries, Inc., for 19 years. He became chief engineer of that firm in 1945 and vice president, engineering, in 1950. From 1950 to 1954 he was consultant for Naval Ordnance Test Station, Pasadena, Calif., on problems relating to engineering organization and production engineering.

Cook Named Chiksan Field Engineer in California

M. W. (Monk) Cook has been appointed a field engineer for Chiksan Co., it has been announced by G. R. Winder, vice president and general sales manager. He will cover the petroleum-drilling, production, and marketing industry throughout southern California.

Cook joined Chiksan with a background of over 35 years in the oil industry. He started as a roughneck in 1919 at Taft, Calif. In 1939 he went to Syria and Iraq as a cementing engineer and ran formation tests. He fin-

ished plugging a majority of the oil wells in the Mosul, Iraq area a few days before the declaration of war in 1939. Returning to the United States, Cook became district manager in the Los Angeles Basin for International Cementers for 7 years. He then represented Chiksan Co. and other equipment companies in the Near and Middle East, with headquarters in Basra, Iraq. During the past 3 years he was associated with Great Lakes Corp.'s Perlite division, promoting the use of Perlite in oil-well cementing and conditions of lost circulation.

J. D. Hughes Named Vice President By Lane-Wells

J. D. HUGHES

Jas. D. Hughes, general sales manager and a director of Lane-Wells Co. has been made a vice president of that technical oilfield service organization, according to John J. Neale, president.

Hughes is also vice president and director of Lane-Wells' Canadian company and a director of Well Surveys, Inc., Tulsa. He joined Lane-Wells in 1941, and was Gulf Coast division sales manager in Houston. In 1945 he was transferred to Los Angeles as sales manager and later was appointed general sales manager and director. He is a director and second vice president of the Sales Executive Club of Los Angeles, and a regional director of National Sales Executives, Inc.; a member of A.I.M.E., A.P.I., Petroleum Production Pioneers, Jonathan Club, and Petroleum Club of Los Angeles. He is a past president of the Los Angeles Chapter of Nomads.

O-C-T Names Branch To Corpus Christi Area

R. G. BRANCH

The appointment of R. G. (Bob) Branch as O-C-T sales representative in the Corpus Christi, Tex., area has been announced by John Maher, president of Oil Center Tool Co.

Branch was employed by O-C-T recently. He was in the sales department at Cameron Iron Works for 7 years and at Heep Oil Corp. for 15 years before joining O-C-T. He is a native of Palestine, Tex.

J. W. Gerrard Joins Darwin H. Clark Co.

James W. Gerrard, an industrial advertising specialist, has joined the staff of Darwin H. Clark Co., as account supervisor of the firm's Los Angeles headquarters. He is first vice president of the southern California chapter of National Industrial Advertisers Association and for the past 5 years has been head of the 15-man advertising and sales promotion department of Beckman division of Beckman Instruments, Inc.

The Clark agency handles many instrument, electronic, oil-tool, chemical, aviation, metal-processing, and other industrial accounts. As exclusive Los Angeles member of Transamerica Advertising Agency Network, it has affiliated offices in 18 principal cities of the United States.

McCullough Opens Service Location At Drayton Valley

McCullough Tool Co. has opened a new service location in Drayton Valley, Alta., Canada, according to an announcement by Norman Brookes, manager of the Canadian division.

This new location was established by McCullough to serve the requirements of the oil industry in the rapidly expanding Pembina area, southwest of Edmonton.

Said to be the world's largest dog house, the three-section, portable McCullough warehouse measures 68 ft. long, 14 ft. wide, and 12 ft. high, and can accommodate and service all McCullough equipment, and house the crews required to serve the needs of the oil industry on a 24-hour basis.

Norman Brookes, and Albert Allan, president of Edmonton Steel Fabricators, inspecting the world's largest dog house, portable 68-ft. work shop, just completed for McCullough's Drayton Valley branch.

Engineering Service To Sell Sivalls Separators

Appointment of Engineering Service Co., Corpus Christi, Tex., as distributor of Sivalls spherical separators has been announced by I. W. Lovelady, president of Sivalls Tanks, Inc., Odessa, Tex.

Houston Parish, owner of Engineering Service, reported that display and demonstration models of the spherical separator are on hand in Corpus Christi. The new distributorship covers 38 counties in the Corpus Christi area.

This is the first distributor named by the tank company. Sivalls maintains headquarters in Odessa and has a branch office, warehouse, and yard in Abilene, Tex. Sales and service representatives work out of Hobbs, N. M., and San Angelo, Tex., as well as Abilene and Odessa.

Ellis Joins Sales Group Of Tuloma Gas Products

L. F. ELLIS

Lance F. Ellis, Jr., has joined the sales department of Tuloma Gas Products Co., wholesale marketers of L.P.G., it has recently been announced by R. A. Carter, president. Ellis will be a sales representative in Tuloma's refinery-sales operations. He will be headquartered in the company's general office at Tulsa.

Carter stated that the increased demand for normal butane used in the blending of finished motor fuels and the refining need for the superior qualities furnished by isobutane in the preparation of high-octane fuels, has made it necessary for Tuloma to expand its refinery-sales operations. And by enlarging their staff of specialists in this phase of the industry, Tuloma can efficiently serve refiners not only with adequate supplies of these products, but also with prompt and effective technical service.

Holden To Represent Born In Texas Gulf Coast Area

Clarence M. Holden, former president of General Industrial Supply Corp., Fort Worth, Tex., and until recently contract administrator for Rohr Aircraft Corp. of California, has been named representative for Born Engineering Co. in the Texas Gulf Coast area.

Dr. Sidney Born, of the Tulsa engineering firm, said Holden will direct sales operations for the company's

the Sign of Dependable SERVICE

ON OIL FIELD SUPPLIES

The men in the field who rely on United Supply will tell you that there's no finer or more dependable service ANYWHERE! United Supply's conveniently located stores—fast, reliable service anywhere at any time and nationally known quality products all add up to best supply service in the industry. Let United Supply show you the way to cut down time to the bone . . . Just call us on your next supply problem—or visit your nearest United Supply Store.

UNITED SUPPLY

AND *Manufacturing* COMPANY

TULSA, OKLAHOMA

Stores in: KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

COURTESY • SERVICE • DEPENDABILITY

Upflo heaters in the Texas Gulf Coast area and will work with Born Engineering Co.'s clients and prospective clients in servicing accounts.

The new offices of Born Engineering Co. will be located at Houston. The appointment of Holden as Texas Gulf Coast representative marks the latest move in an expansion program under way at Born Engineering Co. which is headquartered in Tulsa. Other offices are located in New York City, Denver, Los Angeles, Shreveport, La., and in France and Argentina. An affiliate firm, Canadian Brown Steel Tank Co., Ltd., is located in Brandon, Man., Canada.

Ajax Names Elwood To Sales

Ajax Iron Works, Corry, Pa., has announced the appointment of George P. Elwood as sales and service representative for the Rocky Mountain area, with headquarters in Denver. Elwood has been associated with Ajax since 1950 as sales and service representative in West Texas.

Homco Announces Several Sales Staff Changes

Houston Oil Field Material Co., Inc., has announced a number of personnel transfers and promotions.

Donald Erskine has been promoted from field salesman at Sullivan City, Tex., to manager of the Homco store there.

W. S. George, formerly field salesman at Alice, Tex., is now doing telephone sales in the Houston offices of Homco.

Richard Morgan is now field salesman at Odessa, Tex. He was formerly a field salesman at Freer, Tex.

J. W. Clampitte has been transferred to the directional drilling department in Houston as a sales and service engineer. He was formerly directional drilling superintendent for Southwest Texas in Corpus Christi.

In Odessa, F. E. Sandefer has been promoted from directional drilling engineer to field representative.

Frank Singletary, formerly directional drilling superintendent of the West Texas area, has been transferred to Corpus Christi as directional drilling superintendent of the Southwest Texas area.

W. J. Upton has been advanced from office clerk to assistant store manager in New Iberia, La.

W. K. Holmes Joins Sales Staff Of Master Tank

W. K. HOLMES

Will K. Holmes has joined the sales staff of Master Tank & Welding, Dallas, according to an announcement by Sam O. Weempe, coowner. Holmes will specialize in the sale of anhydrous ammonia equipment, including applicators, tank transports, and storage tanks up to 30,000-gal. capacity.

Holmes was formerly associated with Agricultural Chemical Equipment Co. and traveled throughout the Midwest on sales of bulk-storage plants, engineering service, safety equipment and fittings. Prior to this, he had his own L.P.G. dealership in western Tennessee, was in the sales department of Anchor Petroleum's L.P.G. division and spent 12 years with Texas Co. in the sales department.

Gronauer Becomes O.P.W. General Sales Manager

R. W. GRONAUER

The appointment of Roy W. Gronauer as general sales manager has been announced by Gilbert B. Richards, president of O. P. W. Corp., manufacturer of valves, fittings, and assemblies for handling hazardous liquids. Gronauer will succeed Harry F. Heinzerling, formerly vice president and general sales manager of O.P.W. who retired after more than 35 years of service to the valve industry.

Gronauer joined O.P.W. in 1950 as sales engineer and was appointed assistant general sales manager in 1952.

Marion-Osgood-General Consolidates Department

Establishment of a consolidated sales and service department for the entire line of Marion-Osgood-General equipment in both the domestic and export markets, has been announced by Marion Power Shovel Co.

D. E. Rizor has been named to head the coordinated program as vice president for sales and service. Kenneth E. Williamson, Marion - Osgood - General sales manager, small machines, is concentrating his activities in the sale of equipment in sizes of 4 cu. yd. and under, through a distributor organization throughout the United States and Canada. Richard M. Bessom, as export sales manager, is in charge of sales of the complete line of machines through a world-wide organization of distributors abroad.

Coordination of sales and service of the entire line of Marion-Osgood-General excavating equipment, power shovels, and cranes is designed to provide greater convenience to customers, in the purchase of both new machines and replacement parts, it was pointed out by John P. Courtright, president.

Le Roi Names Sullivan Assistant Sales Manager

P. D. SULLIVAN

Paul D. Sullivan has been named assistant sales manager according to an announcement by J. E. Heuser, general sales manager, Le Roi Division.

Sullivan will headquarter in Milwaukee moving from New York where he has been in charge of contractor sales since joining the Le Roi Division of Westinghouse Air Brake Co. more than a year ago. He will be concerned primarily with promoting the sale of Le Roi portable air compressors and Westinghouse stationary air compressors, both manufactured by Le Roi Division in Milwaukee.

Sullivan joined Clyde Equipment Co. in Oregon as a construction-machinery sales representative in 1936. In 1940 he became a resident field engineer in Oregon and southern Washington for Gardner-Denver Co. That company appointed him special representative in 1946 in charge of large engineering projects in the central and eastern parts of the country.

G.S.I. Announces Personnel Changes

A series of organizational and personal changes has been announced by Geophysical Service, Inc., Dallas, which this year completes a quarter century as a geophysical contracting firm.

According to Executive Vice President F. J. Agnich, the divisional changes include the promotion of Ray H. Wright and V. W. Teufel to managers of the southern and southeastern divisions respectively. Both men were formerly supervisors in G.S.I.'s southern division. Wright will be located in Houston and Teufel will headquarter in Shreveport, La.

The opening of a district office in

Midland, Tex., has also been announced. It will be headquarters for R. H. Rainey, supervisor in the G.S.I. Mid-Continent division and Earl Thomas, southern division supervisor.

Home office changes include the transfer of E. J. Toomey and Hal J. Jones to G.S.I. from the firm's parent company, Texas Instruments, Inc. Toomey will service as marketing service representative and will specialize in foreign and marine contract work. Jones will serve as area geophysicist for the entire domestic area.

Toomey was one of the first G.S.I. employes, having joined the firm in 1933 as a field-party member. He has since held a number of positions, including superintendent of the geophysical laboratory and senior mechanical engineer. He was later transferred to T.I. and was chief sales engineer for geophysical equipment there when he was retransferred to G.S.I.

Jones joined T.I. in 1952 as senior engineer and was director of geophysical research at the time of his transfer to G.S.I.

Cardinal Shifts Daniels

Gordon Daniels, development engineer for Cardinal Chemical, Inc., has been transferred from Hobbs, N. M., to offices in Midland, Tex., it has been announced.

Daniels will represent Cardinal as sales and development engineer in Midland and Midland County.

Ajax Iron Moves Platt To Los Angeles Office

Ajax Iron Works, Corry, Pa., has announced that Howard O. Platt, coordinator of sales and engineering, now will make his headquarters in Los Angeles.

Until he joined Ajax in August 1954, Platt had been president of R. B. Moore Supply Co., Bolivar, N. Y. Prior to 20 years of service in the supply business, he was development engineer for Joseph Reed Gas Engine Co.

Aitkenhead Becomes District Sales Manager for A.C.F.

The appointment of Harold M. Aitkenhead to district sales manager of the St. Louis, Mo., office of A.C.F. Industries, Inc., has been announced by sales Vice President Frederick H. Norton.

Aitkenhead, formerly sales agent in the St. Louis office, will report to E. B. Carpenter, western sales manager. Aitkenhead came to A.C.F. in 1936.

Tuloma Builders Announces Two Executive Appointments

The election of Earl Powell, construction engineer in the Arkansas-Oklahoma-Louisiana area, to vice president of Tuloma Builders, Inc., and the appointment of Buddy Brothers, former head coach of the University of Tulsa football team, to assistant to the president of Tuloma, have been announced by Tuloma President Clyde W. Wyant.

Powell will be in charge of all general construction work for Tuloma in Arkansas and Louisiana and will head the company's sales program in the two-state area. For 9 years, Powell has been an engineer and job superintendent for Midwestern Constructors, Inc. His previous experience also includes design and survey work on power lines and gas lines, and constructing pumping stations and industrial plants.

Brothers will handle Tuloma's public relations, safety program, and employes' trust fund.

Tuloma, formerly part of Midwestern Constructors, Inc., was formed last August and specialized in engineering and construction of gasoline, industrial,

This isn't exactly the problem we're referring to, but the need for an **automatic** shut-off valve can be just as drastic.

The Enardo tank shut-off valve is completely **automatic.** You can therefore eliminate those second trips to close the tank valves. When the pipeline valve is turned on, the Enardo shut-off valve locks in the open position. When the oil reaches a predetermined shut-off level in the tank, the valve will close **automatically.** Check valves are available in ALL models, saving installation of extra checks.

Stop wasting time and gasoline. Write Enardo today for further information about the Enardo **automatic** tank shut-off and check valve models.

ENARDO manufacturing company
BOX 1647 • TULSA, OKLAHOMA

and chemical plants, gas compressor and oil-pump stations, and water-flood units.

Bailey Meter Establishes Dallas District Office

Bailey Meter Co., Cleveland, Ohio, manufacturer of industrial instruments and automatic control equipment, has announced the establishment of a new office in Dallas.

F. D. Krusemark is manager of the Dallas office, located at 6331 Aberdeen Ave., Dallas 30. The Dallas district covers the territory of northern Texas and northwestern Louisiana.

Plastic Applicators Name Garner To Managers' Post

Cordell Garner has been named sales manager of the new tubular division of Plastic Applicators, Inc., Houston. Formerly sales manager for Tube-Kote, Inc., Garner has been engaged in the development and application of plastic coated tubular goods since 1948.

In making the announcement of the new division of the company and Garner's appointment as sales manager, G. J. Duesterberg, president of Plastic Applicators, said that a new plant, designed especially for coating tubular goods, has been added to the company's facilities. This plant permits the use of new techniques in applying baked-on plastic coatings.

Dowell District Managers Hold Meeting in Houston

John G. Staudt, executive vice president of Dowell Incorporated, gave the address at the opening session of a 2-day quarterly meeting of Dowell district managers at the Shamrock Hotel, Houston, early in January. Others who spoke before the group included Dr. A. P. Beutel, president, and A. C. Polk, vice president and general manager.

A wholly owned subsidiary of Dow Chemical Co., Dowell was organized in 1932 to offer a chemical service to the oil and gas industry. Prominent among the various services it now offers for the improvement of wells, are its widely used formation fracturing methods known as Sandfrac, Petrofrac, and Stratafrac.

In 1954 Dowell became the major stockholder in United Oilwell Service, S.A., a service company with headquarters in Caracas, by acquiring the interest of Herbert Hoover, Jr., who has since become Undersecretary of State. This company, formed by Hoover about 10 years ago, has been associated with Dowell since that time. It offers the same services to industry in northern South America as Dowell does in the states.

Detroit Diesel Names New Factory Represenetative

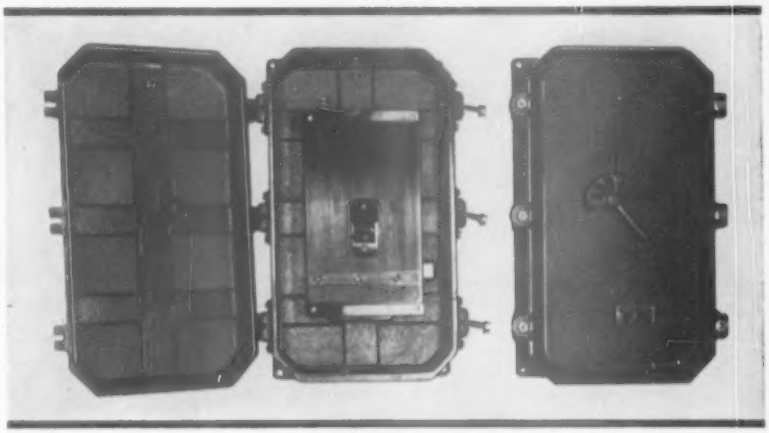
Detroit Diesel Engine Division, General Motors Corp., has appointed Charles H. Stewart factory sales representative to serve G.M. Diesel distributors in the Dakotas, Minnesota, Nebraska, Iowa, Kansas, and the western half of Missouri. He succeeds William R. Bays who is now the G.M. Diesel distributor at Wichita, Kans.

Stewart was formerly service representative for Detroit Diesel in a Texas zone and has been with the division since 1946. His experience with General Motors Diesel engines dates from World War II during which he served as instructor of diesel servicing and maintenance in the Army Ordnance Department.

C. F. Davy, who served the division as sales representative in this area temporarily, returns to his former post in a southeastern sales zone.

Specify NELSON

WATER-TIGHT & DUST-TIGHT AIR CIRCUIT BREAKERS



Inside and outside views: Nelson 225-ampere frame, 3-pole, 250-volt breaker with 125-ampere trip rating.

Designed to provide automatic fuseless protection and control for power and lighting circuits, Nelson water-tight and dust-tight (NEMA IV & V) air circuit breakers:

1. Utilize thermal-type breakers, assuring dependable circuit protection.
2. Enclosures of high tensile cast iron are produced in our own foundry.
3. Hinged covers are securely held in place by swing bolts. Rubber gasket excludes dust.
4. Breakers can be furnished in ratings up to and including 600 amperes, 600 volts.

Write for descriptive bulletin.

NELSON Electric MANUFACTURING CO.
TULSA, OKLAHOMA

217 N. DETROIT AVE. TELEPHONE 2-5131

WIDESPREAD *for experience*

LOCALIZED *for personal service*

CORE LABORATORIES, INC.

801 CORE STREET, DALLAS, TEXAS

CORE LAB

PETROLEUM RESERVOIR ENGINEERING

EXPLORATION

Northwest Arkansas—Neglected Prospect?

by Frank J. Gardner

Recent gas discovery at Moreland field (arrow) is expected to stimulate Arkansas Valley activity.

IT'S a little amazing that the surge of wildcatting in recent years has bypassed northern Arkansas. Scores of rank tests have been sunk in strange new basins. Areas that are hard to reach even by jeep or by mule have attracted deep drilling. But somehow, the northern counties of this state have seen only a handful of wildcats in the past 5 years, and they offer every sign that leads to oil and gas discovery.

Gas fields . . . Gas has been produced in the Arkansas Valley since 1902. About 28 fields have been developed and they are noted for longevity. Now, 225 wells in these fields are producing 23 million cubic feet of gas daily, and cumulative production is at the 236-billion mark.

This is sweet dry gas, 96+ per cent methane. And there lies one of the reasons why exploration men have discounted the chances for oil in the valley. The producing sands (Atoka and Morrow) are part of a thick Pennsylvanian section that has displayed rather high carbon ratios, and contains many coal seams. But the pre-Pennsylvanian section throughout the northwest quarter of the state has never been fairly tested by the drill—and these are the rocks that offer oil and gas prospects far greater than, say, the section in Nevada or Arizona.

Why have these prospects been neglected? Certainly not because of past dry holes, for there simply have been none deep enough to condemn the area. Most geologists agree that the chances are good.

Should beget more gas . . . For the gas hunters, there are still many good chances for success within the Arkansas Valley—a good example of this is Moreland field arrowed on the map. Here, in December 1954, Murphy Corp. 1 Barton (Pope County) was completed for 1,900 M.c.f. of gas per day from the Atoka sand at 4,000 ft. to open a new field 12 miles from the nearest production at Tate Island. With one exception, all the fields in the valley produce from the Atoka, and nearly all of them produce from two or more sands. The exception is Cecil field (Franklin County), the only one to find Morrow gas.

The sands that produce this gas are thin, and occur on gently folded anticlines. There is no associated oil, and chances are that none will be found, but today's demand for sweet dry gas makes further search vital. This may well happen, for 1954 saw much more activity than at any time since 1949. The Morrow discovery at Cecil was made in that year by Arkansas Louisiana Gas Co. 1 Barton, and it stimulated leasing activity throughout the western part of the valley. It led to five new fields and boosted the gas reserves of the area to more than 220 billion cubic feet. Nearly a million acres are under lease in the valley now.

Besides this economic effect, the Barton well provided lots of stratigraphic dope and helped to trace the Ozarkian section beneath the valley. It penetrated a complete Paleozoic section to 6,650 ft., well into the Ordovician, and proved the Ozarkian nature of the subsurface in this vicinity.

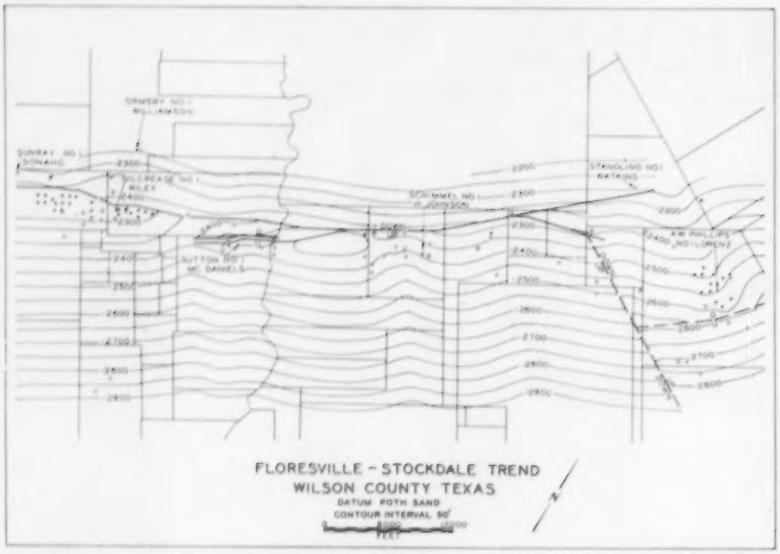
And possibly oil . . . What are the chances for oil in northern Arkansas? Well, there are more reasons for it than against it, especially in the Ozarks and the Arkansas Valley.

In the mountain country to the north, there is an essentially complete section of sedimentary rocks of Upper Cambrian through Mississippian age; at least 16 principal unconformities have been identified; favorable structures abound; oil staining, oil seeps on outcrops, and oil odors from fractured surface rocks have all been reported; and the few wildcats drilled have nearly all found showings of some kind. Local folds and domes with 50-200 ft. of closure lie along the south edge of the "Ozark Platform" as it dips southward. Potential source beds and potential reservoir beds are numerous, and a major fault system separates the platform from the Arkansas Valley to the south.

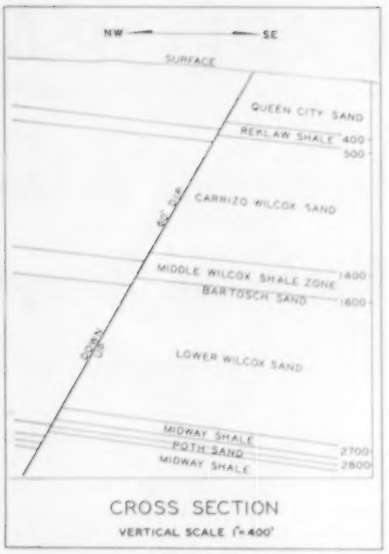
In the valley area, there are proven gas fields producing from Pennsylvanian sands. Only two formations now produce, but no doubt other Pennsylvanian beds can be made to yield more gas, if not oil; many untested anticlines are known; and if no oil exists in the upper section, a more-than-favorable pre-Pennsylvanian section of Ozarkian-Arbuckle facies offers deep possibilities below 7,000 ft.

In the Fourche Mountain belt of overthrusting, sharp structures and extensive overthrust faults are believed to mask a buried pre-Pennsylvanian section with definite oil possibilities at depths below the thrust planes. Rocks here are sharply folded and highly metamorphosed, but numerous reports of asphalt deposits and oil seeps are recorded.

Here is a wide area to prospect. It's an area of knowns and unknowns, semi-condemned by loose geologic theory and the wildcatter's lack of interest. It's hard to believe that the industry will long permit it to be crucified on theory, and the minute some wildcatter hits oil, there'll be "gold in them thar mountains."



ALIGNMENT of fields along the fault line is evident in this structure map. This Poth sand has been the most productive in the trend. Fig. 1.



THIS is the stratigraphic section and faulting along Floresville-Stockdale trend. Fig. 2.

Floresville-Stockdale: Where Shallow Pools May Mask Deeper Pay Horizons

by L. L. Palmer

Here's a brief report on a series of South Texas fields that may receive more play in the months ahead. They're already producing at depths up to 3,000 ft. along an interesting fault trend. Now the author, in concluding his report, suggests that even more production may be found in deeper sands.

THE Floresville-Stockdale trend is located approximately 35 miles southeast of San Antonio, in the east central portion of Wilson County, Texas. A line drawn from Floresville through Stockdale and extending about 8 miles northeast beyond Stockdale could be called the axis of the trend.

The surface in this trend is covered by Weches and Queen City (Mount Selman) formations of Eocene age. Repetition of the Queen City formation 7 miles northeast of Floresville led to the discovery of the Floresville fault.

Faults at surface . . . The Floresville up-to-the-coast fault was discovered by R. D. (Bob) McClure while working for Dilworth Hager in February 1932. Excellent surface exposures of this fault with strike approximately N. 70 E. are found in a road ditch on the farm-to-market road No. 1922, 1½ miles southeast of the Floresville-Stockdale state highway No. 97 and on the Texita Oil Co. Taylor lease in East Floresville field. This fault, which controls production in the field, has a displacement of 130 ft. The fault or faults in this general zone have been cut in several wildcat wells northeast of East Floresville field. But no surface expression, such as occurs in East Floresville field, has been found northeast of the Taylor lease.

There are several sandstone dikes striking approximately N. 70 E. in the area northeast of Stockdale. Drilling done adjacent to these dikes has not revealed any degree of displacement. It is believed that these dikes are fractures with possible minor displacement (5 to 20 ft.) which have allowed ground waters to indurate the formations immediately adjacent to the fracture and thus left a ridge of hard sandstone or dike which has resisted erosion.

Some of these dikes rise as high as 6 ft. above the ground surface and appear as a solid rock wall. One of the most prominent is found on the Denning farm 1 mile south of Acleto Creek field.

The main Floresville-Stockdale fault passes through the north side of the town of Stockdale and is present in wells as far as 2 miles northeast of Stockdale. From this point northeastward, no faulting has yet been proved by drilling. Although the fault is known to be present north of Stockdale, its surface expression, if any, is not recognizable. The fault is cut by wells on the north side of Stockdale. In the Schimmel-Palmer 1 Johnson, Poth sand test, it has a displacement of 100 ft. and cuts this well at a depth of 700 ft.

It is interesting to note that this fault, or fault zone, ceases to exist northeast of Stockdale where it enters Acleto Creek field area. No faulting of importance has been found to date in this field. There is approximately 60 ft. of faulting in the Stanolind 1 Watkins well under the Poth sand at a depth of

Author is independent geologist, San Antonio. This paper was presented at the fourth annual meeting of the Gulf Coast Association of Geological Societies, November 1954, and is printed here with permission of the G.C.A.G.S.

3,450 ft., or about 700 ft. below the Poth sand. This may be the fault which controls production in Acleto Creek field. This fault is over 2 miles north from the lowest producing well in the field. Also, the Poth sand had shows of oil and gas north of this fault in the Eddy 1 Cane.

Poth sand . . . This sand, to date, is the most important producing horizon in this trend. The name Poth comes from the town of Poth. It was given to the sand found in the discovery well of Poth field. The field opened by Holland Oil Co. 1 Boysen in 1942, about 5 miles northeast of Poth and 10 miles southeast of Floresville.

The Poth sand is found at approximately 2,700 ft. in East Floresville field; at 2,800 ft. in Palmer field, 1 mile to the east; and as low as 3,075 ft. in Acleto Creek field, 4 miles northeast of Stockdale. The gravity of the oil produced in this sand gets higher as the producing sand is found at a greater depth. Gravity is 22° in East Floresville and the oil is black in color. Palmer field oil is 24° gravity and is a dull green, while the oil at Acleto Creek is dark green and 27° gravity.

This producing member consists of a firm, fine-grained, shaly sand with alternate shale laminae. It covers a zone of approximately 12 to 20 ft., and actual effective sand averages 10 to 12 ft. The initial production in wells averages 25 to 30 bbl. per day on pump, then drops off to around 12 to 15 bbl. per day after a few months. Production has held steady in East Floresville field.

Palmer field, discovered in October 1953, is too young to have a production history. In Acleto Creek field, the wells appear to be somewhat better than in East Floresville field. But it too has not been in long enough to establish a production history.

Development of Poth sand production . . . East Floresville field was discovered by Sunray Oil Corp. 1 Hardy well in September 1948. After drilling its 1 Donaho to a depth of 7,510 ft. in the Glen Rose formation, Sunray found that the well had cut the Floresville fault just below the top of the Edwards. Sunray then moved southeast to a point where the fault would be cut above the Midway (Poth) sands, and was successful in finding the Poth productive on the high side of the fault.

Acleto Creek field was discovered by the A. W. Phillips and Arkansas Fuel 1 Lorenz well in October 1950. Palmer field was discovered by Sutton Drilling Co. and L. L. Palmer 1 McDaniel in October 1953. In January 1954, Sutton Drilling Co. acquired leases immediately up-dip from the discovery well in Acleto Creek field and started an active drilling campaign. To date, eight Poth sand wells have been completed by this company.

In early May of 1954 Jergins Oil Co. drilled its 1 Talbot 1½ miles northwest and up-dip from the northernmost production in Acleto Creek field and found the Poth sand productive.

It is believed that this well will prove to be in the same reservoir as Acleto Creek production. This will give Acleto Creek field an oil column of 260 ft. Most of the wells in Acleto Creek field produce water regardless of structural position. The field is believed to have a water drive, but it is difficult to understand the presence of water in wells which are structurally high. Perhaps there are many individual reservoirs in the Poth sand which are separated by very minor faults or permeability barriers.

In contrast to the long, narrow fault line of East Floresville field, Acleto Creek field appears to be producing on a long northwest - southeast trending nose. No dry holes have been drilled as yet.

Bartosh sand . . . In January 1954, Gilcrease Oil Co. and L. L. Palmer opened the Bartosh sand to production with their 2 Riley in East Floresville field. The Bartosh sand is the first in the top of the lower Wilcox sand formation. It is roughly equivalent to the top producing sand in Falls City field, a multiple-sand field producing in numerous sands of the lower Wilcox formation on the down side of a 300-ft. down-to-the-coast fault. The 2 Riley was so located as to cut the up-to-the-coast fault just above the Bartosh sand.

Coring in the Bartosh sand showed 16 ft. of oil-saturated, medium-grained sand from 1,593 to 1,609 ft. Cores show saturations as high as 44 per cent oil by pore space. The well is presently producing 11 bbl. of 23° gravity oil per day along with fresh water. Many of the leases in this field which are producing from the Poth sand should also produce Bartosh oil. It is believed this sand will also produce against the fault in other places along the Floresville-Stockdale trend.

Carrizo sand . . . One of the most interesting developments along this trend has been the development of gas production in the Carrizo sand at the town of Stockdale. This production was discovered in December 1952, by L. L. Palmer and G. R. Schimmel at their 1 Johnson within the city limits of Stockdale.

The well is perforated in the top of the Carrizo sand from 462 to 464 ft. It has a shut-in pressure of 205 psi. and potentialled for 1,750 M.c.f.d. of gas, open flow. Subsequent tests were drilled at the 2 Johnson and 1 Robles, both being completed as gas wells. All three wells were drilled with the idea of opening oil production in the Carrizo sand. Cores show oil saturations as high as 33 per cent by pore space, but there is apparently no oil column present on this up-to-the-coast fault structure. The gas is completely dry.

Deeper possibilities . . . The deeper horizons in this trend have important possibilities. The Edwards lime had good oil shows in the Sunray 1 Donaho where the Floresville fault was cut just below the top of the Edwards. The Buda lime produced at the rate of 250 bbl. per day on the pump for 1 week at the Ormsby 1 Williamson before going to water. The Stanolind 1 Watkins produced oil for 6 months on the pump from the Georgetown lime.

No tests have yet been located in such a manner as to test the Austin chalk which is now a prolific producing formation at Saspamco in northern Wilson County and at Lavernia.

The Floresville-Stockdale trend presents many possibilities for oil and gas production in a number of different horizons. Any test well must be located so as to cut an up-to-the-coast fault a few hundred feet above the objective horizon. This trend should see increased drilling activity in the near future.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

KANSAS

Rooks County Recorded New Arbuckle Discovery

Rooks County on the Central Kansas uplift has a new Arbuckle pool at Sterling Drilling Co. 2 Bartos, SE SE NE 22-9s-19w.

The discovery well swab-tested 18 bbl. of oil per hour from the Arbuckle lime at total depth of 3,589 ft. The new pool is only ¾ mile west of Jelinek field production, but there are dry holes between.

Operator Will Test Good Arbuckle Shows In Barton

Good shows of oil in the Arbuckle were reported at a Barton County wild-

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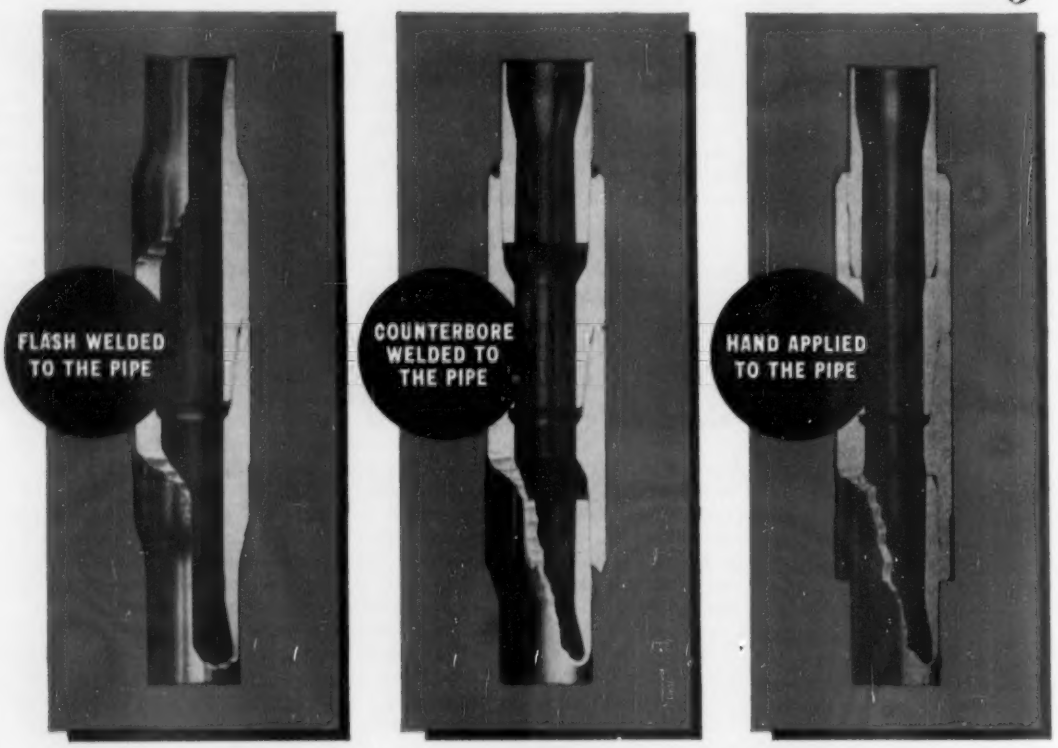

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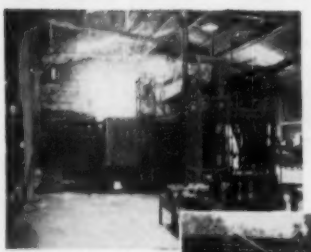

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cat. Duke & Wood Drilling Co. has set pipe to test these shows.

The indicated discovery is the 1 McMullen, SW SW NE 3-20s-13w. The prospect lies 1 mile east and ½ mile north of the discovery well of new South Bend field. The discovery at that field was Schermerhorn and Thunderbird 1 Hart, NE NE NW 9-20s-13w. It completed for 190 bbl. of oil per day from the Lansing-Kansas City.

Graham County Wildcat Is Promising New Strike

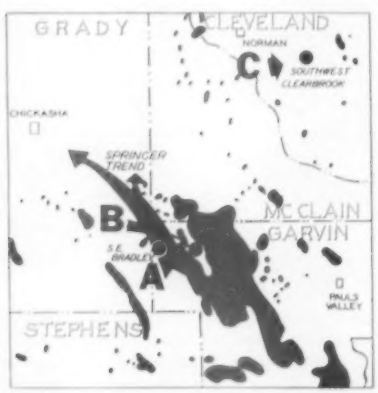
Graham County on the uplift has a promising Lansing prospect at Heathman-Seeligson Drilling Co. 1 Erwin, SW SW NE 12-10s-23w.

Recovery on a drill-stem test in the Lansing was 2,200 ft. of gas and 510 ft. of oil at 3,846-58 ft. Another test at 3,718-26 ft. got 30 ft. of oil-cut mud and 60 ft. of muddy oil. This wildcat prospect is 2 miles southeast of Law pool.

OKLAHOMA

Garvin County Side, Bradley District Expanded to the East

Magnolia Petroleum Co. tested Springer sand production at 1 Bradley Unit in C NW SE 18-4n-4w, Garvin County. The well added a 40-acre east extension to the district. The well flowed 152 bbl. of oil in 14 hours on 18/64-in. choke from Springer sand perforations at 9,042 to 9,114 ft. It then produced 126 bbl. in 8 hours on 20/64-in. choke after treatment. Gravity is 40°. Gas-ratio is 468:1.



Springer production has been extended east in general Bradley area at A on map. Hart sand test flowed gas-distillate at well in Southeast Lindsay (B on map). Continental Oil Co. will drill deeper in Bromide pay at Southwest Clear Brook field well (C on map).

Southeast Lindsay . . . Hap Drilling Co. has a gas-distillate well in this Garvin County field at 1 O'Connor, C NE SW 24-4n-4w.

The well flowed 75 bbl. of distillate with 1,000 M.c.f. of gas from the Hart sand through perforations at 7,930-74 ft.

Cleveland County . . . The Bromide will be penetrated deeper at Continental Oil Co. 1 Allen Unit in NE SW SE 15-8n-1w, Southwest Clear Brook field well.

The well flowed 25 bbl. of oil in 5 hours and swabbing netted 19 bbl. in 3 hours from open hole at 7,198-7,212 ft.

The same operator has shut in the 1 Maruska in C SW SW 16-10n-4w, West Short Junction, after flowing 39 bbl. of oil per day on ⅛-in. choke from the Hunton lime through perforations at 8,220-8,316 ft.

North Madill Outpost Proved Second Bromide Sand Pay

Second Bromide sand pay has been proved at Sinclair Oil & Gas Co.'s 1 Little in SE NW SE 15-5s-5e, expanding the North Madill field play in Marshall County.

A drill-stem test was made at 6,145-83 ft. with gas coming to surface in 4 minutes at 310 M.c.f. per day. Oil flowed in 47 minutes at 25 bbl. hourly. The wildcat extension try hit the second

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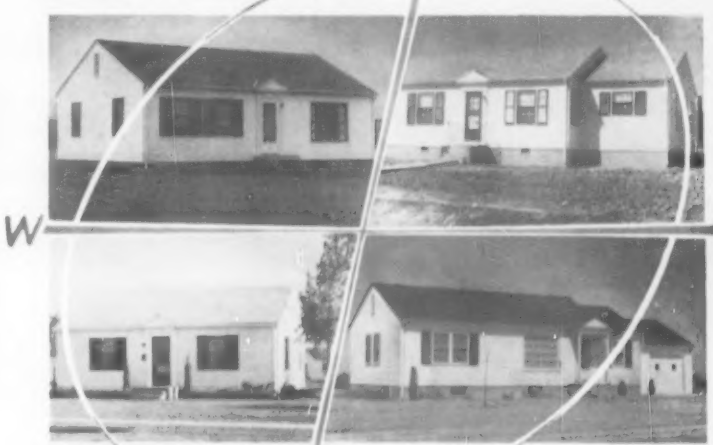

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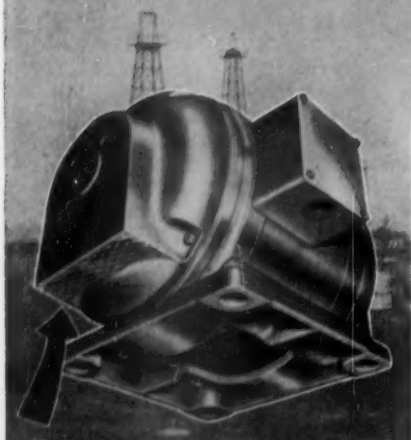

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Hart Sand Discovery Made In West Lindsay-Bradley Area

Cities Service Oil Co. has opened a new Hart sand reservoir in the West Lindsay-Bradley area of Garvin County at 1 McCoy, C NE NE 17-4n-4w.

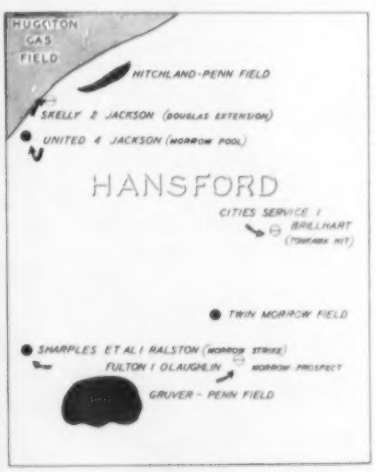
The well flowed 51 bbl. of oil in 14 hours through 12/64-in. choke before freezing. Perforations were made at 8,148-62 and 8,248-62 ft. Testing has resumed. Phillips Petroleum Co. has an east offset to the strike under way.
and 5 ft. oil-cut mud.

HUGOTON EMBAYMENT

TEXAS PANHANDLE

Hansford Activity Hits Fast Discovery Clip

Last year's rapid expansion of pre-Permian production in northeastern Hansford County, off the southeast flank of big Hugoton field, is picking up 1955 steam. The accompanying



Four important wildcats headline exploration in Hansford County, Texas.

map indicates the widespread activity in the county.

Four important wells furnish the new year's early discovery record in the county. They are: Skelly Oil Co. 2 Jackson, Section 51, Block 1, WCRR Survey . . . an indicated Douglas sand extension in the Hitchland-Penn field area; Sharples Oil Corp. and Baker & Taylor Drilling Co. 1 Ralston, Section 10, Block 2, SA&MG Survey . . . Assumed Morrow gas discovery; Cities Service A-1 Brillhart, Section 45, Block 45, H&TC Survey, 4 miles northeast

of Twin Morrow field . . . indicated Tonkawa discovery; and R. H. Fulton 1 O'Laughlin, Jr., Section 19, Block 2, WCRR Survey, 3½ miles southeast of Twin Morrow field . . . Morrow discovery or extension in area.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Bend Oil at Dora Roberts

The Dora Roberts-Ellenburger field in Midland County has a new pay, Pennsylvanian Bend. Forest and Cities Service, openers of the area, made a heavy flow of oil on a drill-stem test at 10,108-10,128 ft., at their 2 Roberts B-1, southwest offset to the discovery.

The above section was treated with 1,000 gal. of mud-acid. After cleaning itself, the well flowed several hours at the rate of 60 bbl. an hour. Choke was 1-in., flowing tubing pressure was 325 psi. and gas-oil ratio was 966:1.

This well also made a 205-bbl. an hour flow from the Ellenburger at 12,945-13,035 ft. It will be dually completed, and will be the fifth well in the new field.

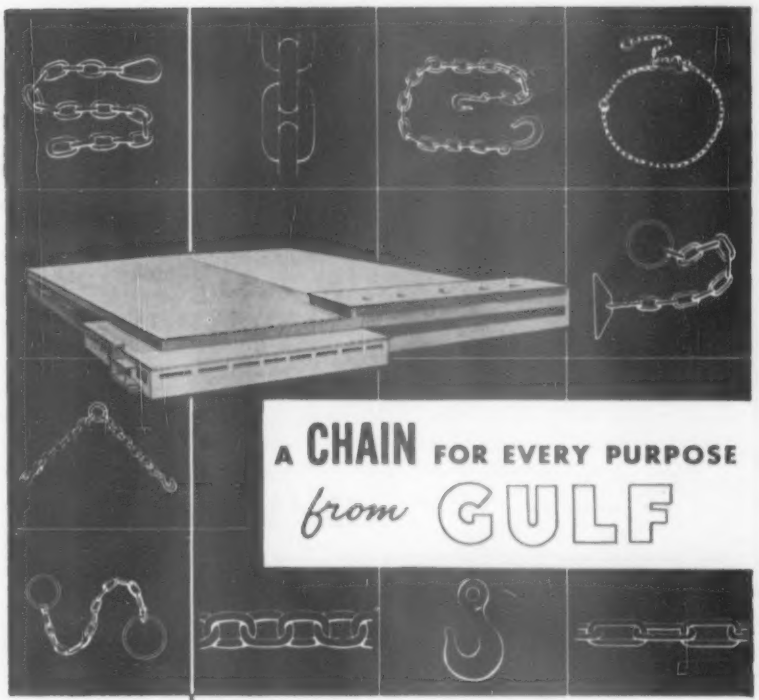
Winkler County . . . Stanolind 20 Sealy Smith Foundation had penetrated the Devonian at this report, tested slight oil and gas shows in the Fusselman, and was drilling ahead at 10,100 ft. in limestone.

Top of the Fusselman by samples was 9,850 ft., minus 7,071 ft. On test at 9,850-9,976 ft., open 1½ hours, recovery was the 400-ft. water blanket, plus 90 ft. of gas and slightly oil-cut mud. Flowing pressure was 335 psi. This well flowed oil on two drill-stem tests in the Devonian.

Borden County . . . Tennessee Gas Transmission Co. 1 Fambrough, an extension test in a new area which produces from the Spraberry and the Pennsylvanian, swabbed oil from a Pennsylvanian reef section.

Location of the well is in Section 18, Block 33, Township 3 North, T&P Survey, in the southwestern corner of the county, near the Howard-Borden county line. Perforations in the reef were from 9,027-45 ft. Operators set packer at 8,941 ft. and swabbed out oil load, then washed with mud-acid, again swabbed the load and 30 bbl. of new oil. At that time it kicked off and flowed 30 bbl. of new oil and died. Flowing pressure was 100 psi.

Ellenburger extension at Deep Rock . . . Ralph Lowe 1-E Hayden Miles, ⅜-mile from production on the eastern side of Deep Rock-Ellenburger field,



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Andrews County, made a big well. Completion potential was 3,144 bbl. of 45.4° oil. Choke size was ¾-in., tubing pressure was 420 psi. and gas-oil ratio was 420:1. Top of pay was 12,214 ft., on elevation of 3,164 ft., and final perforations were between 12,210-95 ft.

Terry County . . . A drill-stem test in the lower Clear Fork at Tri-Service Drilling Co. and Lion Oil Co. 1 Mitchell recovered oil shows. A 2-hour test was made from 7,740-94 ft. Recovery was 560 ft. of gas, 60 ft. of free oil and 45 ft. of mud. Flowing pressure reached 95 psi. Operators drilled ahead.

Location of the test is 10 miles due east of the northeastern end of Prentice field, which has Clear Fork production.

ARK-LA-TEX

ARKANSAS

New Tokio Oil Discovery For Northeastern Lafayette

C. G. Davis and Guy R. Smith completed 1 Knighton, C SE SE NW 35-15s-23w, northwest of Buckner in the northeastern part of Lafayette County in southwestern Arkansas.

The Tokio oil discovery pumped 40 bbl. of 14.7°-gravity oil per day from perforations at 2,464-68 and 2,472-75 ft.

West Lewisville . . . Potential is being taken at R. W. Burnett and Associates 3 Moore Addition in SE NE 16-16s-24w, West Lewisville field, Lafayette County.

The well pumped 50 to 70 bbl. of oil per day from open hole at 2,846-50 ft. in the Tuscaloosa, making it the second Tuscaloosa well in the field.

EAST TEXAS

Oil Discovery Completed In Cayuga Gas Field

The one-well Cayuga gas field southwest of Malakoff in Henderson County now has a Rodessa oil producer. Pure Oil Co. 1 Stephens Lake Land Co., William Keese Survey, flowed 241 bbl. of 43.7° oil in 24 hours on completion test. The flow was through 24/64-in. choke, under tubing pressure of 775 psi., and with gas-oil ratio of 900:1. Production was from perforations at 7,436-44 ft.

Texas Crude Oil Co., Fort Worth, has staked location for a 7,800-ft. wildcat which will seek Rodessa production. The well will be 1 W. R. Kinnabrew, located 9 miles south of Malakoff townsite, in the A. Martinez Survey. Drill site is 1,650 ft. southeast of Pure Oil Co. 1 Gamble, dry hole in the Northwest Cayuga area.

Anderson County wildcat . . . Location has been made for a Woodbine wildcat 3 miles north of Palestine in central Anderson County. Nat P. Huggins, Johnson Cone and Adam Cone, Jr., Athens, have filed application to drill 1 Fee in the William Kimbro League. Projected depth is 5,000 ft. Location is 10 miles southwest of the fast-growing Neches field.

GULF COAST

SOUTHWEST TEXAS

Austin Chalk Produces In New Frio County Discovery

A new Austin chalk field, located 5 miles northeast of Pearsall, in Frio County, is being opened by Howeth & Mason, San Antonio operators.

The discovery well, 1 Schuchardt, is being completed on the pump making 19 bbl. of 27°-gravity oil per day with a small percentage of water. Pay is in open hole at 4,923-5,260 ft.

The well was drilled by W. E. Bakke, who turned it to Howeth & Mason for completion.

The discovery is one of a half dozen new Austin chalk producing areas which have been made within the past year along the Pearsall trend through Frio County. It is about 2½ miles northeast of Sutton Drilling Co.'s prolific discovery well, 1 Newsome, completed last November.

TEXAS GULF COAST

Second Well Completed In New Oil Pay at Viola

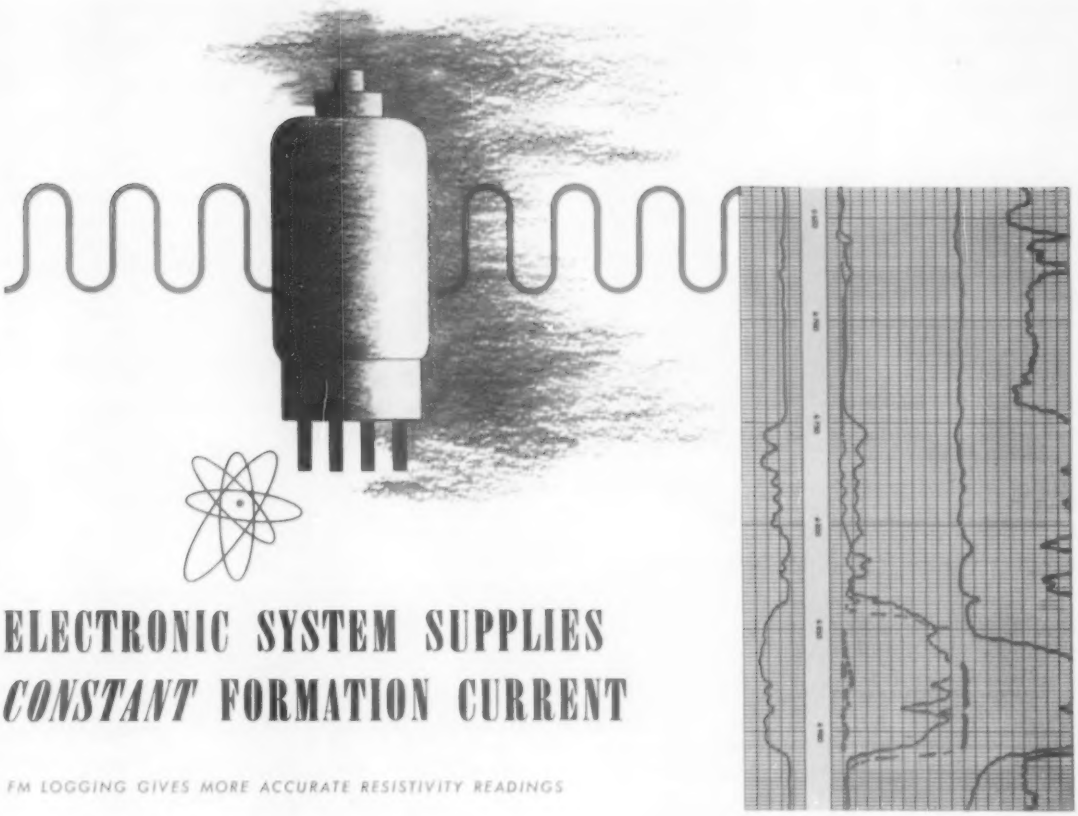
Renwar Oil Corp. and Phillips Petroleum Co. have confirmed their recent discovery of a 4,400-ft. oil-productive sand in the small Viola field, west of Corpus Christi, in Nueces County.

Their second well in that pay appears better than their discovery producer. It is their 5 Blacknall, which flowed 297.12 bbl. per day through 7/32-in. choke. Its flowing pressure gaged 800 psi. on the casing, and 400 psi. on the tubing. Gas-oil ratio was 198 cu. ft. per barrel. Pay is perforated at 4,414-18 ft.

The discovery well, 4 Blacknall, completed two weeks ago, flowed 53 bbl. daily through open tubing with perforations at 4,431-35 ft.

Gravity of the oil from both wells is 24°.

Previous production, from two wells,



ELECTRONIC SYSTEM SUPPLIES *CONSTANT* FORMATION CURRENT

FM LOGGING GIVES MORE ACCURATE RESISTIVITY READINGS

False readings of apparent resistivities, due to varying or uncontrollable output of formation current, is one of the major weaknesses of conventional logging systems. But a new electronic system, which strictly controls the *exact value of formation currents,* records potential measurements that directly indicate apparent resistivities.

Halliburton's Frequency Modulation Logging gives you this greater help for accurate interpretation—and does it with more speed and accuracy! Vacuum tube metering circuits, electronic controls and carrier frequency transmission signals help to correct errors before they are measured and recorded. For example, electronic tube circuits generate a constant output of formation current that is precisely controlled by an internal regulator or by a signal transmitted from surface equipment. Any variations in current strength are immediately equalized, without loading the source of potential currents, to give measurements that are free from current variation errors.

This electronic instrumentation also increases accuracy of resistivity readings by reducing to negligible value all logging cable interference from leakage, conductor resistance and magnetic properties. And with simultaneous transmission of a natural potential and three resistivity curves, all required data is recorded in one fast trip for only a few cents a foot. You can always be sure of more accurate interpretations and more help for all operations when your analyses are based on the electronic accuracy of the FM Log. For this extra help—without extra cost—call your local or district office of the Halliburton Oil Well Cementing Company.

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has been from a 5,500-ft. sand. The field was discovered in 1947.

San Patricio County Gets Two New Oil Discoveries

Appell Oil & Gas Corp. has a new oil-discovery well 3 miles southeast of Mathis, in northwestern San Patricio County. It is the operator's 4 Brown, completed on the pump making 57 bbl. of net oil per day from perforated interval at 4,433½-41 ft. Gravity of the oil is 34°. Production is with approximately 25 bbl. of water daily and a gas-oil ratio of 580 cu. ft. per barrel of fluid. Total depth is 5,007 ft.

Five miles south, in the same county, Lonnie Glasscock is completing his second well in the recently opened Round Lake field. The new well, being completed in two zones, tested dry gas in sand at 5,640-46 ft., and oil from sand at 5,870-72 ft. Oil flow was at the rate of 61 bbl. daily through ⅛-in. choke with pressure of 560 psi. and gas-oil ratio of 795 cu. ft. per barrel. Gravity is 41.2°. Gas flow from the upper sand was not gaged.

Glasscock's discovery well, 1 Weir, completed last October, got gas-condensate production from perforations at 5,832-36 ft. The 5,640-ft. gas sand in the second well is a new pay for the area. Both sands are in the Frio-Vicksburg section.

New Dry Gas Production Revealed at North Inez

Kirkwood & Co. is completing another large gas well and opening a new pay zone in the North Inez area, 7 miles northwest of Inez, in eastern Victoria County.

Its 1 Heinke, west of the discovery well, is rated good for 50,000,000 cu. ft. of gas daily on open-flow gage. The new pay from which it produces is perforated at 2,576-82 ft.

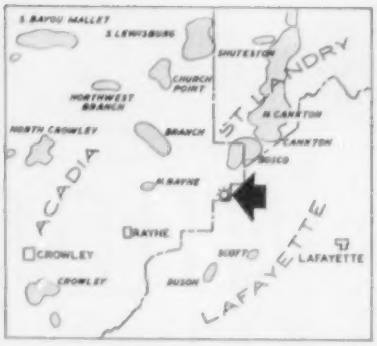
The discovery well, completed last June by Sam Broadhead at 1 Karnes, is productive from sand at 4,166-70 ft. It flowed at the rate of 12,000,000 cu. ft. of gas daily.

Drilling of Kirkwood & Co.'s Heinke gasser follows the completion last December by the same operators of a well (1 Musselman), about 1 mile northwest, with a calculated open-flow potential of 110,000,000 cu. ft. of gas daily from perforations at 3,206-10 ft.

SOUTH LOUISIANA

Deep Sand Produces In Acadia Parish Wildcat

California Co. is opening a new deep-sand field in extreme eastern Acadia Parish. Its discovery well, 1 Martin, is productive of gas and condensate from a 14,100-ft. sand, perforated in three intervals from 14,082-120 ft. Flow, in a 6½-hour gage through 7/64-in. choke, was at the rate of 60.3 bbl. of 45.2°-gravity condensate with gas-liquid ratio of 1,015 cu. ft. per barrel.



Location (shown by arrow) of California Co.'s new, deep gas-condensate discovery well in eastern Acadia Parish.

Location, in 9-9s-3e, is about 5 miles northeast of Rayne, near the Lafayette Parish line. It is 2½ miles south of the old Bosco field, nearest production, and 3½ to 4 miles east of the deep, multiple-sand North Rayne field, where Continental Oil Co. is active.

Bayou Pigeon Extension Produces in Two Sands

A wildcat located 1½ miles northwest of production at Bayou Pigeon, in the northeastern tip of Iberia Parish, is virtually assured of commercial gas-condensate production from at least two deep sands already tested.

The wildcat, 1-C Jeanerette, drilled by Continental Oil Co., flowed at the rate of 109 bbl. of 49°-gravity condensate and 3,876,000 cu. ft. of gas per day through 15/64-in. choke while testing perforations at 12,070-13,000 ft.

Previous tests in a deeper sand, perforated at 12,207-32 ft. got a flow rate of 16 bbl. of 48.6°-gravity condensate and 555,000 cu. ft. of gas per day through 15/64-in. choke.

Hole was drilled to 13,001 ft.

GREAT LAKES

MICHIGAN

Salt Well Comes Up With Salina-Niagara Gas

The International Salt Co., coring for possible salt mine prospects in Romulus Township, Wayne County, has uncovered the newest basal Salina-Niagara gas prospect in southeastern Michigan.

A salt core test, located in the NE SE NW 15-3s-9e, Romulus Township, and just off the sprawling 2,000-acre Wayne County Airport, encountered a gas blow-out in the basal Salina. Exact information about the depth, and amount of gas which showed from this small diameter core hole is not available, but blow-out is believed to have developed at about 1,950 ft., and gas showing to the surface has been estimated (and possibly gaged) at from 200,000 to 400,000 cu. ft. a day. The International Salt Co., with no interest in the hydrocarbon minerals in the area, will plug this core hole as soon as lost core barrel and diamond bit can be recovered.

Leasing activity has been booming in the area since notice of this gas show was issued about 3 weeks ago. The area is complicated as far as leasing and possible development for oil and gas is concerned by virtue of the Wayne County Airport, which probably will not be available for on-location development; the possible expansion of the airport by condemnation proceedings; and by the generally small tracts of land in this semi-metropolitan area. However, The Taggart Co., Sun Oil Co. and others have been reported to be paying more than average wildcat lease prices in the area, and in some instances, drilling commitments have been included on some executed leases. It is expected that one or more Niagara and Trenton test wells will be drilled in the area before the middle of the year.

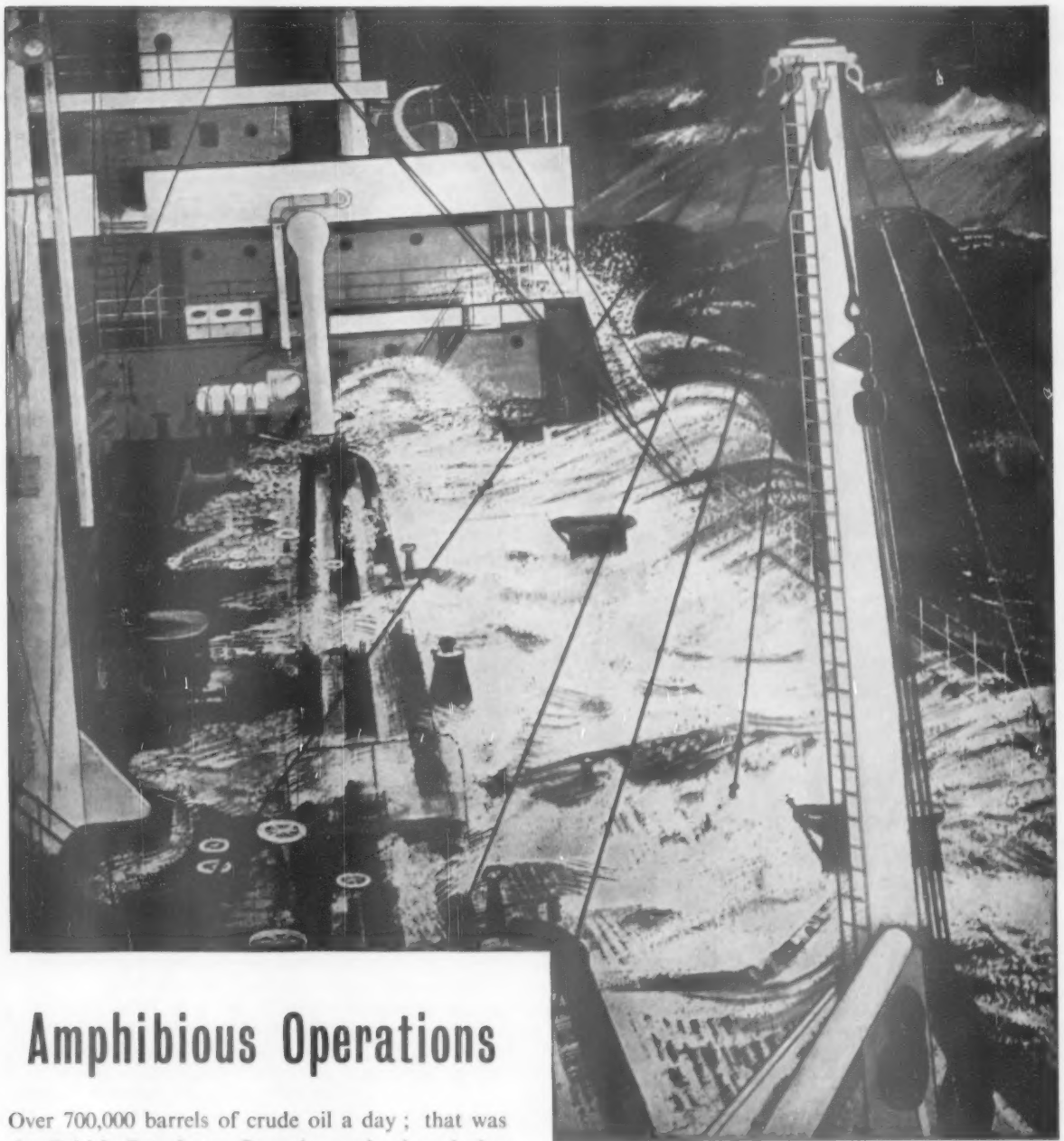
EASTERN INTERIOR

ILLINOIS

In Wabash County, 2 miles northeast of Allendale, Ardee Oil Co. is at 3,569 ft. at 1 Schafer, SW NW NE 31-2n-11e. This is an important wildcat.

● In Gallatin County a new pay, the Palestine at 1,930-50 ft., has been established at Pintozzi Oil Co. 1 Hoff, ½-mile stepout from Inman pool. The

The Eldorado area of Saline County has 32 active operations, making it the hottest area in Illinois.



Amphibious Operations

Over 700,000 barrels of crude oil a day ; that was the British Petroleum Group's production during 1954, and shipping it was a full-time job for the 7,000 officers and men of its shipping organisation, the British Tanker Company, one of the world's largest privately-owned fleets.

While ships of this fleet crossed and re-crossed the world, British Petroleum prospectors were searching for more oil in desert lands, tropical jungles and beneath the seabed itself.

A new refinery came on stream at Aden last summer to join the 12 others already operating in seven countries. A fourteenth, at Kwinana in Western Australia, is almost ready to go on stream.

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

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well is located in the NE NW SW 22-8s-9e, 2 miles northeast of Ridgway.

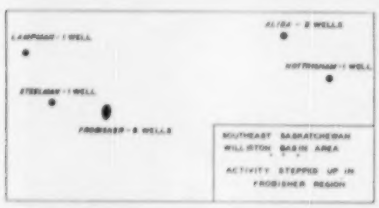
● In Washington County Canter Drilling Co. is completing at 1 Malawy, SW NW SE 27-3s-2w, 6 miles northwest of Dubois and 2 miles from production. The operator cored the Benois (Bethel) sand at 1,282-87 ft. with recovery of 5 ft. of good saturated oil sand reported.

WESTERN CANADA

SASKATCHEWAN

Middle Vanguard Discovery Reported In Gull Lake Area

The past week's drilling operations in western provinces accounted for five



new discoveries. Two of the new strikes were in Saskatchewan, while the rest fell within the boundaries of Alberta.

The most encouraging find was in the Gull Lake area at Anglo-American-Gridoil 5-26A Gull Lake, LSD 5, 26-13-19w3. The well flowed gas during a drill-stem test at 3,488-3,520 ft. in the middle Vanguard. Gas was also tested in excess of 6,000 M.c.f. per day in the basal Cantuar formation.

Prelate area . . . Saskatchewan's other find was reported at Phillips Petroleum Co. and Husky Oil & Refining Co. 2 Prelate, LSD 2, 22-23-25w3.

This Viking sand discovery flowed gas at the rate of 10,000 M.c.f. per day, estimated.

ALBERTA

Basal Quartz Gas Strike Recorded In Heisler Area

Canadian Gulf Oil Co.'s wildcat in the Heisler area of Alberta, the 4 Congdon, LSD 4, 23-42-16w4, got its gas in the basal quartz.

This strike flowed gas to the surface on drill-stem test at the rate of 2,000 M.c.f. per day.

West Tees . . . About 20 miles northeast of Lacombe in central Alberta, Brinkerhoff Drilling Co., C. U. Bay & Associates, Charter Oil Co., Canadian Oil & Gas Reserves, and Nairb Oils discovered gas in the glauconitic sand.

This discovery, Brinkerhoff 1-32 West Tees, LSD 1, 32-41-23w4, flowed at the rate of 1,530 M.c.f. of gas per day on drill-stem tests.

East Chancellor . . . The other Alberta strike, Socony-Vacuum Oil Co. of Canada, Ltd., 10-11 East Chancellor, LSD 11, 10-25-20w4, tested gas in excess of 3,000 M.c.f. per day on test of the basal Blairmore.

PACIFIC COAST

CALIFORNIA

New Gatchell Field In Coalinga Area

Los Nietos Co. apparently has discovered a new Gatchell sand field 2 miles southeast of the Guijarral Hills field in Fresno County. Its 55-1 Bourdieu, in NW SE 1-21s-16e, on a 2-hour formation test at 10,612-77 ft. flowed 27° gravity crude at an estimated 1,000 bbl. daily rate. The wildcat continued to core ahead following the test.

Production in the Guijarral Hills field is from the Leda and Allison sands, of Oligocene age, at depths of 8,000 to 9,000 ft. Nearest Gatchell sand production is from Coalinga Nose—outstanding field in the Coalinga area—some 5 miles north. Offsetting acreage north of the new Polvadero field is held by Standard Oil Co. of California.

Kettleman Well Testing

Middle Dome Corp. halted drilling in its deep test in the Middle Dome area of Kettleman Hills, Kings County, to test shows in the Johnston formation at 9,312-96 ft. Prime objective of the Standard of California-Bolsa Chica Oil Corp. test, in 19-23-19e, will be the McAdams sand at a depth below 12,000 ft. The wildcat reportedly cored the shallower Burbank zone without shows.

Pipe Set in Corning Test

Slick Oil Co., Ltd. was preparing to test two zones at its wildcat in the Corning area of Tehama County. After halting drilling at 4,864 ft., pipe was set at 3,324 ft. and a 5-in. liner run to 4,800 ft. The operator planned to test gas shows at 3,328 and 4,635 ft. in Cretaceous sands. Location of Slick 2 Buttes-Corning is in 11-24n-3w.

Cuyama Test Coring

A wildcat in the Taylor Canyon area northwest of Cuyama Valley, San Luis Obispo County, was coring ahead after a formation test at 5,441-5,515 ft. recovered some oil. G. J. Greer 28-24 Chimeneas-Arnold yielded a 1,185-ft. fluid recovery after a 2½ hour test. Of this the top 390 ft. was oily gassy mud and the next 350 ft. clean 38°-gravity crude. Located in 24-32s-19e, the wildcat is 1½ miles northwest of the Taylor Canyon field.

ROCKY MOUNTAIN

COLORADO

Moffat Wildcat Is Apparent Gas Discovery

Moore & Gilmore, Halbert & Jennings and U. S. Smelting, Mining & Refining Co. have reported a flow of 3,000 M.c.f. per day from shallow formations at a Moffat County wild-

Lance gas discovery reported at North Lay Creek, Moffat County, Colorado.

cat. The well 1 Kern, C SE NE 13-8n-93w, in the North Lay Creek area blew out when test was attempted. The operators reported the hole bridged at 750 ft., with the gas flow from above this depth, possibly from Lance.

The well was drilled to a total depth of 7,381 ft. It was scheduled as a Mesaverde test and topped that formation at 4,044 ft. No shows were reported in lower formations and the wildcat was plugged back to 1,940 ft. for testing. At last report, operators were preparing to run pipe.

Jefferson County Discovery On Production

S. D. Johnson, Denver independent has reported flow of 70 bbl. of oil in 3 hours through 14/64-in. choke at 1 Pallaoro, SW NE NW 7-5s-69w, in the Morrison area of Jefferson County. Production is from Codell through perforations at 8,956-80 ft. The well flowed nearly 124 bbl. of oil in 21 hours on 9/64-in. choke, Johnson said.

The wildcat, a deep test (total depth 9,655 ft.) along the faulted mountain front area on the west flank of the Denver-Julesburg basin showed gas on early tests, with some oil also reported. Oil production is only recently been started, following full installation of production equipment. No confirmation location has yet been reported.

Johnson has made location for another test in this area, further to the north in the Golden area of the county. It will be 1 Farmers Highline Canal and Reservoir, SE SE NW 7-3s-69w. It will go to Skull Creek at about 10,000 ft.

Small Elbert County Discovery Completed

Sinclair Oil & Gas Co. has completed 1 Bradbury, NE NE NE 28-6s-61w, Elbert County. A pump gage of 15 bbl. of oil and 13 bbl. of water per day was reported. Production is from "J" sand. The well is about 30 miles south of previous production in the Denver-Julesburg basin, and is the first producer for Elbert County. It is one of a series being drilled through the general area by Sinclair. Previously completed wells in the series have offered no encouragement.

Discovery Completed In Morgan County

John L. Nelson has reported a pump gage of 150 bbl. of oil per day at 1 Fornick, C NW SW 1-6n-59w, Morgan County. The well is a "D" sand discovery, with production from 6,474½-80½ ft. It is 8 miles south of Buckingham, and the discovery has been named Jackport field.

El Paso, Huerfano Have Rank Wildcat Locations

Lion Oil Co. has made location for a "J" sand test at 1 Higgins, C NW NW 19-14s-61w, El Paso County. The well will go to about 6,300 ft. It is 28 miles east of Colorado Springs. There has been very little drilling in the area.

In Huerfano County, Owen R. Lee Drilling Co. has made location for 1 Capps, NW NW NW 24-28s-65w, 9 miles southeast of Walsenburg. No objective has been reported for this wildcat.

UTAH

Confirmation Location Staked at Desert Creek

Shell Oil Co. has made location for a confirmation attempt in the Desert Creek area of San Juan County. The well is 26-36 Desert Creek, SE SE 35-41s-23e. It will test Paradox. The discovery in this area, drilled last year, produced from Paradox and became the first commercial oil well for the Paradox basin.

NEBRASKA

Muddy Extension Reported In Harrisburg Field

Stanolind 1 Olsen in Harrisburg field, Banner County, Nebraska, was completed as an extension of Muddy sand production. The well pumped 770 bbl. of oil in 24 hours. The well was drilled at 5,911 ft. and plugged back to 5,892 ft. It extends production one location to the north on a 160-acre tract. The 1 Olsen is located in the SW SW 2-18n-55w.

ALBERTA

Pembina Report

Stanolind-Hudson's Bay A-12 Pembina Crown was completed as a field well in Pembina field, Alberta, Canada.

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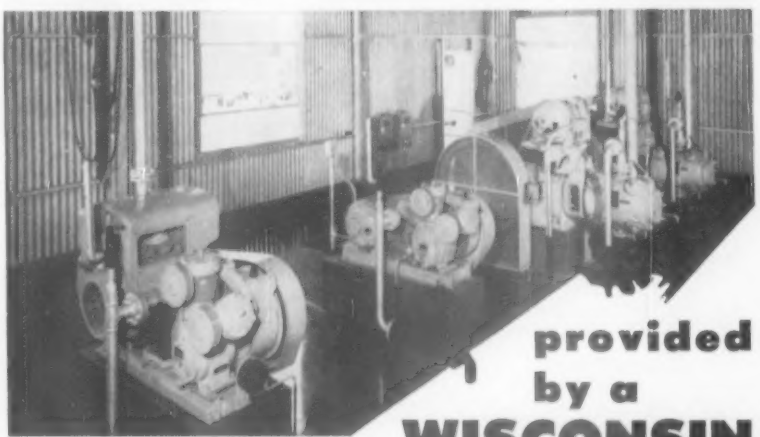

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The well flowed 268 bbl. of 39°-gravity oil in 24 hours through 20/64-in. choke. The Cardium was topped at 5,302 ft. and the well completed at total depth of 5,371 ft. Location is LSD 14, 12-48n-9w5.

WYOMING

Green River Basin Gas Discovery Near Completion

Continental Oil Co., El Paso Natural Gas Co. and Malco Refineries, Inc., are preparing for completion at the apparent Pinedale anticline gas discovery in Sublette County. The well is 1 Unit, C NE SE 9-30n-108w. Production is planned from perforations 9,920-32 and 9,950-82 ft. Both these zones made gas at the rate of 1,500 M.c.f. per day on drill-stem test. Several other zones showed gas in this well, but completion has been scheduled for these two. Details have not been released by the operators but production is believed to be from Fort Union.

Washakie County Wildcat Logs Phosphoria Show

Superior Oil Co. recovered oil-cut mud on test of Phosphoria in the Sherard area east of Worland, Washakie County. The well is 1 Government-Chittim, C SW SW 9-47n-90w. Test of the interval 8,793-8,838 ft. made 950 ft. of oil-cut mud in 1 hour.

The well is on the southeastern flank of the Big Horn basin where Phosphoria production is found in several fields. The operator is reported coring below 9,000 ft.

Madison Pay Extended In Beaver Creek Field

Stanolind Oil & Gas Co. has extended Madison lime production in Beaver Creek field, Fremont County, Wyoming, with the 34-M Beaver Creek Unit.

The well flowed 384 bbl. of oil in 24 hours through ¾-in. choke. Operator is continuing to test. The Madison was topped at 11,374 and plugged back total depth of the well is 11,502 ft. The No. 34-M is located in the NW NW of 10-33n-96w, Fremont County.

MONTANA

Pipe Set at Landslide Butte Area Wildcat

Carter Oil Co. has landed casing and will test Madison at 1 Thelen, C NE NE 13-37n-9w, in the Landslide Butte area of Glacier County. Drill-stem test

at 4,660-75 ft. in Madison recovered 180 ft. of free oil. This upper Madison zone will be tested before the well is drilled deeper. Shows at the current well are higher than those found in 1954 wildcat drilling in this area by Carter and Union Oil Co. of California. Drilling done last year had good shows in lower Mississippian zones and early tests indicated commercial production. Extended testing, however, resulted in temporary abandonment. Both Carter and Union are continuing exploratory drilling through the county.

Roosevelt County Wildcats Still Testing

Deep Rock Oil Corp. swabbed at the rate of 16 bbl. of oil per hour from the interval 9,008-52 and 9,058-74 ft. at 1 LePage, C NW SW 14-28n-59e, Roosevelt County. Later swabbing recovered only salt water and the perforations will be squeezed and the zones reperforated.

Also, in Roosevelt County, Phillips Petroleum Co. and others are testing at 1 Harmon, C NW SW 29-27n-58e, in the Lakeside area. No definite results have been reported. This well was drilled to total depth of 12,638 ft. No shows were found in lower zones and the operators are testing in Madison.

Both these Roosevelt County wildcats had good shows in Madison, but with the formation reported very hard and tight.

NORTH DAKOTA

Dunn County Location Staked

Northwest Oil Drilling Co. has made location for 1 Hamann, SE SE 8-141n-91w, Dunn County. The well is to test Madison at about 8,600 ft. A second location has been staked by Stanolind Oil & Gas Co. and others for a deep test to about 13,500 ft. in NW SW 11-146n-91w.

At F-22-22-I Bird Bear, SE NW 22-149n-91w, Dunn County, Mobil Producing Co. is running logs at total depth of 9,088 ft. The wildcat had good shows in Madison, with little recovery on drill-stem tests. The operator will drill ahead after pipe is set, with Devonian at about 10,600 ft. the objective.

SOUTH DAKOTA

Harding County Wildcat Location Staked

Shell Oil Co. and Carter Oil Co. have made location for a joint wildcat in Harding County. The well is 1 Hansen and Clarkson, NE NE 28-21n-3e. No previous drilling has been done closer than 3 miles.

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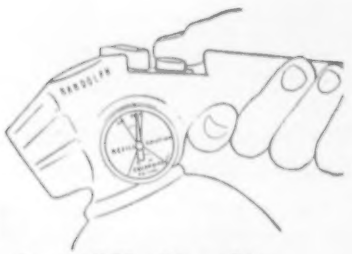

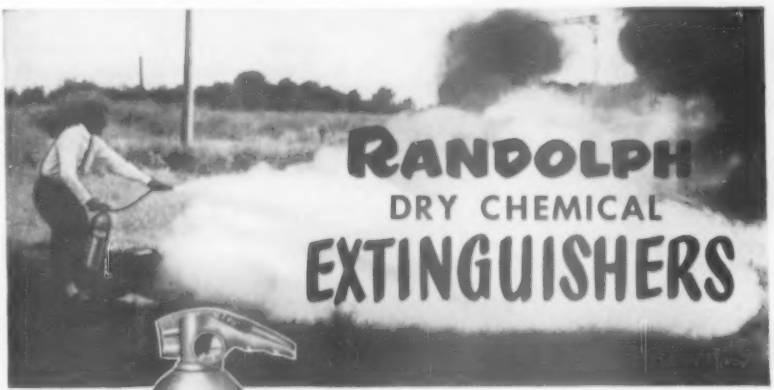

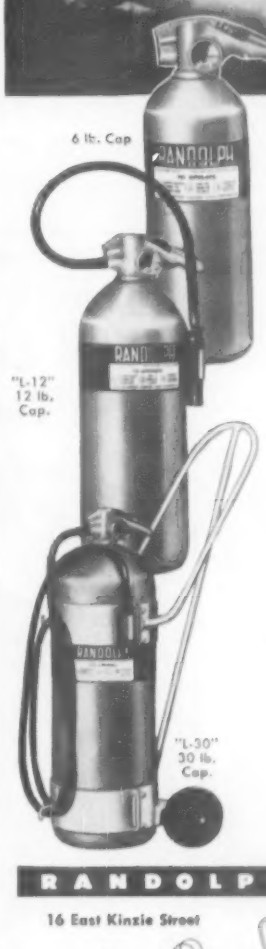

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PENNSYLVANIA

North Central Area Records Two Apparent Discoveries

Two successful wildcat completions and apparent discoveries are reported for north-central Pennsylvania.

The 1 Eva Moore test in Union Township, Clearfield County, previously completed as a dry hole, was reopened and fractured. The operators, Rockton Drilling Co., report an open flow of 500 M.c.f. per day after fracturing.

This is the third success on the Chestnut Ridge anticline in the Clearfield-Indiana-Jefferson County area. Moore test is 15 miles northeast of the Banks Township, Indiana County success of some weeks past. Production in all cases has resulted from fracturing or shooting.

The production zone and characteristics are unknown, but gas is probably coming from a chert zone immediately above the Oriskany which was topped at 7,213 ft.

Leidy area . . . An apparent pool discovery is indicated southeast of Leidy field in Stewardson Township, Potter County. New York State Natural Gas Co. 7 State (Tract 16) reportedly gaged an open flow of 50,000 M.c.f. of gas from the Oriskany with a well-head pressure of 4,000 psi.

WEST VIRGINIA

In Upshur County, Washington district, West Virginia, George I. Tennant 1 C. H. Zickefoose, wildcat, elevation 1,912 ft., gaged 1,205,000 cu. ft., gas after Hydrofrac, sand 1,622-31 ft., gas 1,622-26 ft., TD 1,810 ft.

● Grant district, Jackson County, B. H. Putnam, has announced two locations for drilling to the Oriskany sand. They are on the Keno Quadrangle 1 H. C. Milhoan, elevation 722 ft., 1.95 miles south of latitude 39 degrees 05 minutes and .39 mile west of longitude 81 degrees 45 minutes and 1 J. O. Boggs, elevation 929 ft., .40 mile south and .11 mile west of the same.

OHIO

In the Brownsville area, Mid East Oil Co. brought in a very good well on 9 S. M. Gutridge, Section 23, Hopewell Township, Licking County. Clinton sand was found at 3,102-12 ft., and at 3,119-40 ft., with 20 bbl. natural which was increased by fracturing to 150 bbl. and 30,000 cu. ft. gas in a 5-hour test.

● Mutual Oil & Gas Co. 2 (5) K. R. Boyd, Section 4, Perry Township, Licking County, made 70 bbl. in a 24-hour test after treatment. Clinton was logged at 2,834-85 ft. with a fair showing natural.

● B. H. Putnam et al are drilling a rank wildcat on the Grace Wheeler tract in Section 3, Bristol Township, Morgan County.

Mickley and Workman 1 (8) Clyde Banbury, 2nd Qr., New Castle Township, Coshocton County, ¼ mile from production, found the Clinton at 3,212-57 ft. with 4 bbl. natural and 160 bbl. after fracturing.

● On the east side of Greer pool, Mutual Oil & Gas Co. 6 Clyde Stitzline, Section 25, Knox Township, Holmes County, gaged 200,000 cu. ft. with a good oil showing natural and 225,000 cu. ft. with 120 bbl. in 24 hours after treatment.

EASTERN KENTUCKY

On Bowling Fork of Ulysses Creek in Clay County, United Fuel Gas Co. has completed their 3 Fordson Coal Co. wildcat as a dry hole. Devonian black shale was topped at 2,167 ft., Corniferous lime at 2,205 ft. Total depth was 2,343 ft. with only slight shows of gas

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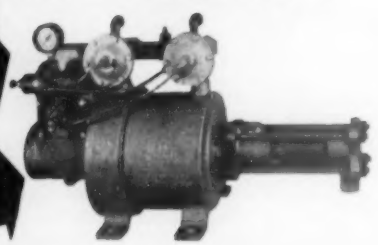

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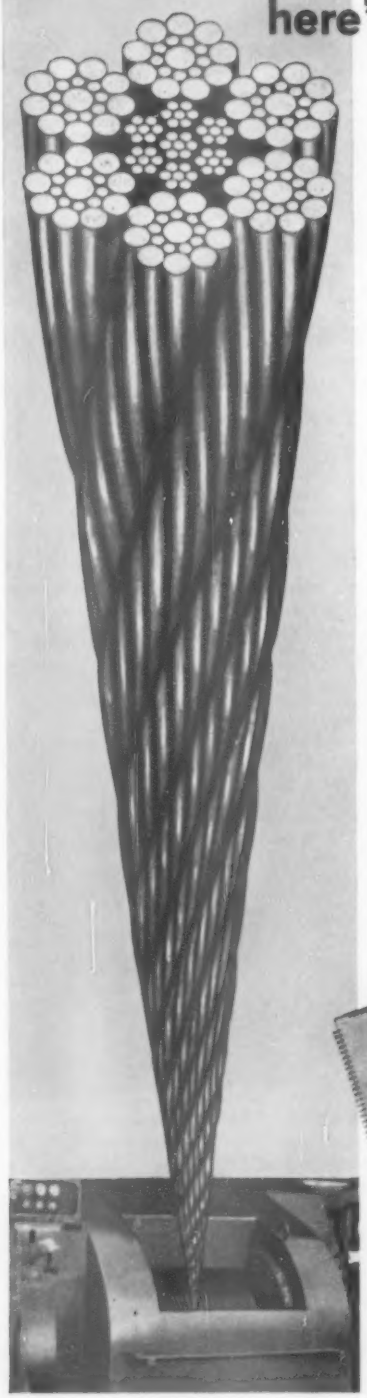

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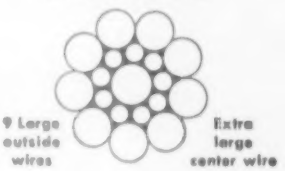

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1⅛"	113,000
1¼"	138,800
1⅜"	167,000
1½"	197,800

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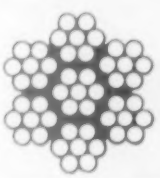

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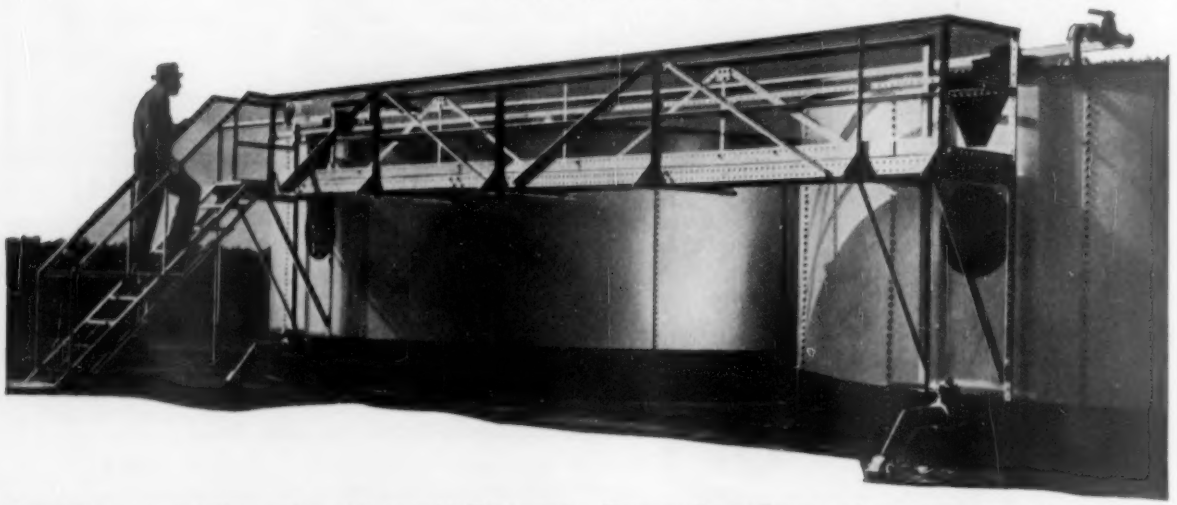

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encountered in the shale and Cornif-erous sections.

● In the Pike County sector of Big Sandy gas field, United Fuel Gas Co. has abandoned its 81 Federal Gas, Oil & Coal Co. at a total depth of 3,981 ft. Berea was topped at 3,095 ft. and Devonian black shale at 3,200 ft.

ILLINOIS

Toklan Royalty Corp. has completed its 3 Ackerman, SW NE NE 26-55-10e, White County, Illinois, with an initial productive rate of 100 bbl. daily from the Rosiclare formation at 3,024 ft. The well is the company's fifth producer on its extension of North Maunie pool.

MISSISSIPPI

New Production Found In Old Tinsley Field

Jones-O'Brien, Inc., has given Tinsley, Mississippi's oldest oil field, another good producer.

It has completed its 7-C Jennie Stevens, a new Tuscaloosa test in the northwest part of the field, with a potential flow of 300 bbl. of 37.4°-gravity oil per day through ¾-in. choke.

The well, drilled to 5,575 ft., is perforated at 5,230-38 ft. in the field's Powell (Tuscaloosa) sand. It also had 25 ft. of net oil sand in the McGraw zone at 5,027 ft., and 17 ft. of net oil pay in the Brumfield zone at 5,130 ft.

Tinsley, in Yazoo County, was opened in 1939, and has more than 300 producing wells. Production is from the Selma chalk, Eutaw, and Tuscaloosa horizons.

FLORIDA

Forty-Mile Bend Field Defined to Southeast

Gulf Oil Corp. has failed in another attempt to extend production in the Forty Mile Bend area, in Dade County, 40 miles west of Miami.

It has abandoned its 3 State of Florida, Lease 340, ¾ mile southeast of the company's 1 State, completed last April as the second of the area's two producing wells. The well, drilled to 11,625 ft. in the Lower Cretaceous formation, found only slight showings and stainings in the Glen Rose-Sunniland lime, the area's producing horizon.

This is the company's second dry hole in the area, the first, 2 State, ½ mile south of 1 State, the producer, was quit last October at 11,597 ft.

Associated with Gulf in these operations are Commonwealth Oil Co. and Coastal Caribbean Oils, Inc. Their discovery well, drilled by Commonwealth, was completed early in 1954, opening the state's second field. It is a small pumper, making considerable water. The second well, also a small pumper, and the two dry holes are 3½ to 4 miles to the east.

Successful Wildcats

SOUTHWEST TEXAS

Atascosa County: Tom Crews 2 Finch, Calba Fuqua Sur. A-271 (2 miles south of Jourdanton). IPP 70.14 BOPD, 18.8°, open hole 1,578-82 ft. TD 1,582 ft. (New field—Crews.)

Duval County: John F. Sullivan 1 Murphy, Gunter Sur. 66, A-1734. IP 57.8 BOPD, 23°, perforations 1,849½-57½ ft. TD 3,665 ft. (New field—Sullivan.)

Hidalgo County: Roy H. Bettis et al 1 Baldwin, Lot 12, Block 4, Hidalgo Canal Co. Subd. (4 miles south of McAllen). IP 39,000 M.c.f. daily, open-flow potential, gas-condensate ratio 84,700 cu. ft. per barrel, 61°, perforations 6,324-30 ft. and 6,336-40 ft. TD 8,772 ft. (New field—South McAllen.)

Jim Hogg County: Gorman-Gierhart & Howe 1 East, A. V. Prado Sur. 40, A-254. IP 144 BOPD, 5/32-in., 34°, perforations 3,740-45 ft. TD 4,275 ft. (New field—Pravdo.)

TEXAS GULF COAST

Matagorda County: Shell Oil Co. 1 State, Tract 486, Gulf of Mexico. IP 23,000 M.c.f. daily, open-flow potential, dry gas, perforations 5,189-5,208 ft. (Mio-

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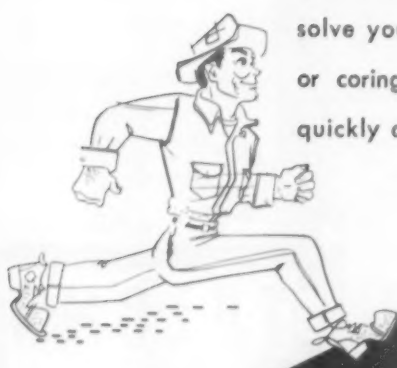

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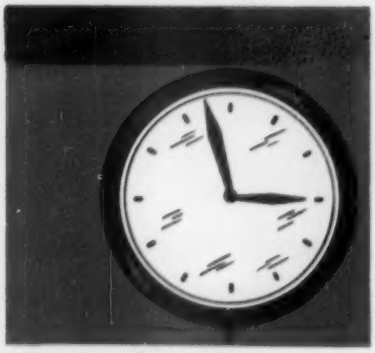

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cene). TD 7,501 ft. (Extends, and new pay in Kain field.)

Victoria County: Kirkwood & Co. et al 1 Musselman, IRR Sur. 56, A-418 (7 miles north of Inez). IP 110,000 M.c.f. daily, open-flow potential, dry gas, perforations 3,406-10 ft. TD 4,515 ft. (New field.)

EAST TEXAS

Henderson County: Hays, Talbert & Walker 1 Cooley, D. Muckleroy Sur., A-503, 2 miles NE Flag Lake field, in old Rowe & Baker field. IP 148.25 BOPD, 14/64-in., 32°, TP 160 psi., GOR 223, Woodbine perforations 3,192-93 ft., elev. 378 ft. TD 3,194 ft.

WEST CENTRAL TEXAS

Coleman County: R & W Drilling Co. 2 Bowen, R. S. Bowen Sur. 2; W offset to Morris sand discovery, 4 miles W Coleman. IPP 60 BOPD, 38.6°, GOR zero, Home Creek sand 1,854-65 ft., elev. 1,844 ft. TD 2,623 ft.

NORTH TEXAS

Archer County: The Texas Co. 1-B Perkins, Block 11, Lot 1, ATNCL Subd., 4 miles SE Mankins. IP 195 BOPD, ¾-in., 42.8°, TP 25 psi., GOR 199, elev. 1,084 ft., Strawn 3,710-48 ft. TD 3,775 ft.

Montague County: Wrather Petroleum Corp. 1 McCormick, C. C. Milne Sur., A-500, 1 mile NW Jaydee conglomerate field. IP 180 BOPD, 14/64-in., 41°, GOR 475, TP 350 psi., conglomerate 6,526-30 ft. TD 6,860 ft.

Young County: F. Kirk Johnson 1 Shanafelt, H. A. McComber Sur., A-208, 3 miles SW Bryson. IP 97 BOPD, 16/64-in., TP 225 psi., 42°, GOR 1,500, elev. 1,212 ft., Strawn 2,952-67 ft. TD 4,448 ft.

Kenneth J. Rich 1 Graham, E. Kellum Sur., A-1782, 9 miles SE Graham. IP 4.1 BOPD, 20/64-in., TP 200 psi., 39°, GOR 300, Strawn 3,190-3,300 ft., elev. 1,200 ft. TD 4,302 ft.

WEST TEXAS

Scurry County: Gray and Salazar 1 Superior-Autry, 96-97-H&TC, 3 miles SW Ira. IPP 472½ BOPD, 26°, GOR 320, pay 3,082 ft., elev. 2,220 ft. TD 3,107 ft.

Tom Green County: American Trading & Production Co. 1 Tom Green County, J. Zerbach Sur. 1827, 2 miles E Christoval. IP 221½ BOPD, 24/64-in., TP 180 psi., GOR 751, 40°, pay 5,335 ft., elev. 2,276 ft., perforated 5,359-71 ft. TD 5,829 ft.

Chambers & Kennedy 1-C Johnson, Samuel Fitzgerald Sur., 1 mile S Christoval, 1⅜ mile NE Hunt 1 Jacobs. IPP 61 BOPD, 41°, GOR 350, Strawn pay 5,250 ft., elev. 2,099 ft. TD 5,625 ft.

Yoakum County: Skelly Oil Co. 1 Shook, 421-D-J. H. Gibson Sur., 5 miles W Plains. IPP 106 BOPD, 31.4°, GOR 240, pay 5,268 ft., elev. 3,741 ft., perforated 5,326-44 ft. TD 5,353 ft.

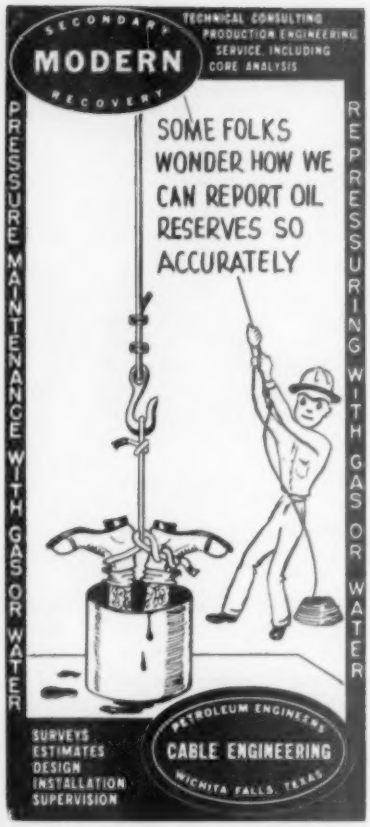
ILLINOIS

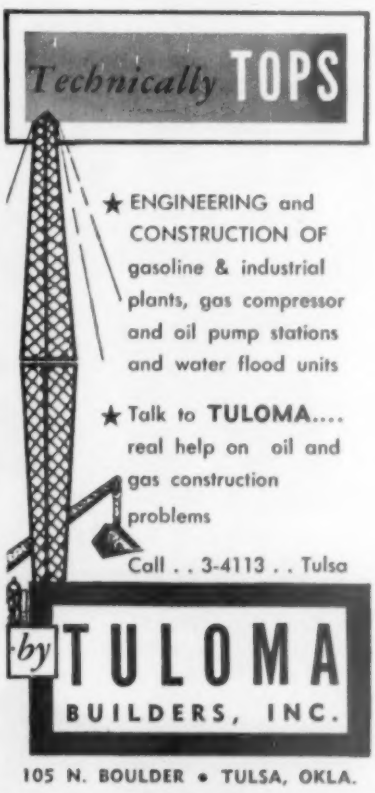
Edwards County: Skiles Oil Corp. 1 Bunting "A," SW SW SE 24-1n-10e. IPP 98 BOPD, Lower O'Mara lime 3,190-94 ft. TD 3,248 ft. (Oil discovery.)

Gallatin County: W. C. McBride 2 Moore, NE NE NE 24-7s-8e. IPP 36 BOPD, Golconda 2,506-11 ft., Benoist 2,784-2,800 ft., Aux Vases 2,927-46 ft. TD 2,967 ft. New pay in Roland (Golconda.)

Wayne County: Calvert Drilling Co. 1 Carter, SE SW NW 22-2s-9e. IPF 289 BOPD, Aux Vases 3,202-38 ft. TD 3,370 ft. (Extension to Ellery Consolidated pool.)

White County: Nash Redwine 1 Bruce, SE NE SE 29-6s-8e. IPP 14 BOPD, Cypress sand 2,707-14 ft. TD 3,166 ft. (Extension to Norris City pool.)

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WESTERN KENTUCKY

Christian County: Morgan Brothers et al 2 Wells, SW SW NW 25-H-27. IP 500 M.c.f. of gas per day, Benoist 861-871 ft. TD 885 ft. (Extension to Apex field.)

PENNSYLVANIA

Clearfield County: Rockton Drilling Co. 1 Eva Moore, Southwest Union Township. IP 500 M.c.f. of gas per day, Onondaga chert. TD 7,228 ft. Elevation 1,860 ft. Oriskany 7,213 ft.

Potter County: New York State Natural Gas Co. 7 State (Tract 16). Stewardson Township. IP 50,000 M.c.f. of gas per day, Oriskany. TD 6,500 ft. (New pool discovery near Leidy field.)

WEST VIRGINIA

Upshur County, Washington district: George I. Tennant 1 C. H. Zickefoose, elevation 1,912 ft., 1,205,000 cu. ft. after Hydrofrac, show oil at 1,037 ft., gas shows 1,255-60 and 1,622-31 ft., sand 1,622-31 ft., gas 1,622-26 ft., TD 1,810 ft.

SOUTH LOUISIANA

Ascension Parish: Temple Hargrove 2-A Gulf Fee-Belle Helene, 27-10s-2e. IP 133 BOPD, 7/64-in., 32°, perforations 6,729-42 ft. TD 7,088 ft. (New pay in Darrow field.)

Jefferson Parish: Humble Oil & Refining Co. 3-G State Lease 804, Tract 1121, Block 23, Grand Isle Area, Gulf of Mexico. IP 143.4 BOPD, ⅛-in., 42.3°, perforations 6,710-20 ft. TD 6,928 ft. (New field—Caminada Pass area.)

Plaquemines Parish: Shell Oil Co. 1 State Lease 2590, Block 6, South Pass Area, Gulf of Mexico. IP 288 BOPD, 10/64-in., 33°, perforations 8,337-49 ft. TD 11,010 ft. (New field.)

Humble Oil & Refining Co. 3-E State Lease 820, Tract 1203, Block 31, West Delta Area, Gulf of Mexico. IP 228.48 BOPD, ⅛-in., 32.3°, perforations 8,733-50 ft. TD 10,449 ft. (New oil pay in West Delta Block 30 field.)

St. Martin Parish: Kerr-McGee Oil Industries, Inc., 3 St. Martin, 22-9s-7e. IP 237 BOPD, 9/64-in., 35.7°, perforations 11,230-40 ft. TD 12,352 ft. (New oil pay in Section 28 field.)

St. Mary Parish: California Co. 1 Fair Foster Bailey et al Unit 2, 58-14s-9e. IP 45.5 BCPD and 4,820 M.c.f. daily, ¼-in., 41.90°, perforations 12,330-38 ft. TD 13,680 ft. (New pay in Franklin field.)

ARKANSAS

Lafayette County: C. G. Davis and Guy R. Smith 1 Knighton, C SE SE NW 35-15s-23w, 2¾ miles northeast of Stamps, 2⅞ miles northwest of Buckner. IPP 40 BOPD, Tokio 2,464-68 and 2,472-75 ft., 14.7°. TD 4,007 ft. (New pool.)

Union County: Parks & Meabow 1 Simmons, C NW NE SW 12-18s-13w, ⅝ miles north and west of production. IPP 6 BOPD, Nacatoch open hole at 2,293-2,404 ft. 25°. TD 2,404 ft. (Extension to Sandy Bend field.)

OKLAHOMA

Cleveland County: Herman Brown 1 Perkins & Todd, SE SW NW 21-9n-1w, 5 miles east of Norman. IPF 180 BOPD, second Wilcox sand 7,148-58, 34°, 10/64-in. TD 7,824 ft. (Oil discovery.)

Oklahoma County: N. T. Smith 1 Vorel, SW SW SE 14-14n-1e. IPF 60 BOPD, lower Skinner 4,912-17 ft., 30°. 1¾ miles northeast of Luther. TD 5,217 ft. (Oil discovery).

Pontotoc County: Mineral & Materials Co. 1 Busby, NE NE NW 4-4n-8e. IP 5,750

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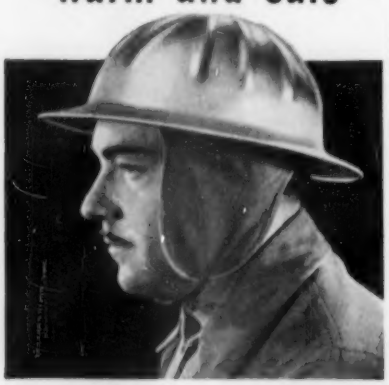

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NEBRASKA

Kimball County: Tom Palmer, Inc. State-C 1, SE SE NW 36-13n-55w. IPP 95 BOPD, "D" sand discovery, new field. TD 6,302 ft. "J" sand.

WYOMING

Sweetwater County, Southwest Table Rock: Gulf Oil Corp. 1 Unit, C NW SW 28-18n-98w. IP 981 M.c.f. of gas per day, Mesaverde discovery, new field. TD 8,605 ft. Baxter.

Weston County, Raven: Nicolai & Miller 1 Williams, C NW NW 33-46n-67w. IPP 50 BOPD, Newcastle discovery, new field. TD 7,183 ft. Newcastle.

COLORADO

Elbert County: Sinclair Oil & Gas Co. 1 Bradbury, NE NE NE 28-6s-61w. IPP 15 BOPD, 13 BW in 24 hours, "J" sand discovery, new field. TD 7,335 ft. Skull Creek. First production for county. Furthest south Denver-Julesburg basin production outside of Canon City-Florence field.

Mesa County, Hunters Canyon: Great Basins Petroleum Co. 1 Unit, SE SW SW 29-8s-100w. Shut in gas well. Mesaverde discovery, new field. TD 2,132 ft. Mancos.

Logan County: Creslenn Oil Co. 1 Ramey, C SE SE 17-10n-53w. IPP 68 BOPD, "D" sand discovery, new field. TD 5,134 ft.

Morgan County: John L. Nelson 1 Fornick, C NW SW 1-6n-59w. IPP 150 BOPD, "D" sand discovery, new field. TD 6,735 ft. Skull Creek.

Washington County: Continental Oil Co. 1 Adkins, NE SW SW 26-1s-56w. IPP 90 BOPD, "J" sand discovery, new pay. TD 5,200 ft. "J" sand.

ALBERTA

Shell 7 Olds, LSD 10, 22-30-1w5. D1 gas well. TD 8,770 ft.

Socony-CPR 15-7 Rosebud, LSD 7, 15-26-21w4. Blaimore gas well. TD 5,101 ft.

Hudson's Bay-Union 11-25 Liberal, LSD 11, 26-68-22w5. D3 oil well. TD 8,565 ft.

NORTH TEXAS

Callahan County Is Active Spot

Wildcat and general development activity in Callahan County has been high for several weeks. Last week's reports included a gas completion and good shows of oil at another test.

Ellenburger gas production was opened 4½ miles southeast of Oplin at Sorrels Oil Co. 1 Scarborough, Section 146, Block 2, GH&H Survey. Open flow potential was at the rate of 9,800,000 cu. ft. of gas a day, through perforations at 4,187-92 ft. Shut-in pressure was 1,500 psi. On 16/64-in. choke the well made 1,630,000 cu. ft. of gas, with flowing pressure of 1,410 psi.

Eastland Oil Co. 1 Joel Griffen, wildcat 4 miles northeast of Clyde, was running oil string to 1,700 ft. after showing oil on drill-stem test at 1,642-50 ft. The test had a good blow of gas throughout and recovered 720 ft. of gas in the pipe, 57 ft. of free oil and 60 ft. of oil-cut mud. This well was carried to 3,250 ft.

"Okay, we'll furnish the pipe and $1,000 dry hole—$2,000 dry—$3,000 dry hole money."

Callahan Rotary Co. has set oil string at 1,850 ft. at their 1 Baum, 8½ miles west of Cross Plains, and 1½ miles southwest of present production. Drill-stem test in the Cross Plains sand at 1,780-90 ft. produced a good blow of gas and recovered 400 ft. of clean oil, 280 ft. of heavily oil-cut mud, and 1,000 ft. of salt water. Flowing pressure ranged from 280-520 psi.

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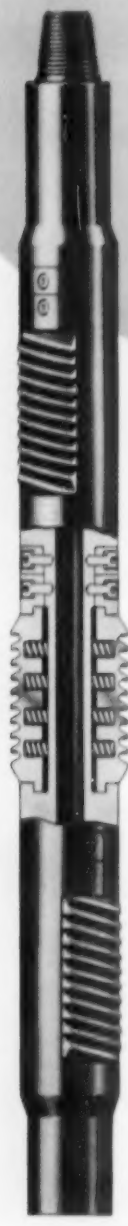

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One Man, Two Jobs

Hunter takes over reins of Yellowstone and Interstate

PHELAN H. HUNTER—accountant, lawyer, tax specialist—acquired two new titles last week. He became president of Interstate Oil Pipe Line Co. and president of Yellowstone Pipe Line Co.

Hunter had been secretary-treasurer of Interstate since 1950 and assistant secretary-treasurer of Yellowstone since last August. He moved up to head of both firms February 1 to succeed George A. Wilson, who resigned.

A graduate of the University of Mississippi, Hunter practiced public accounting in New Orleans 6 years before going into the oil business. Later he received a law degree from Loyola University at New Orleans. He also studied accounting at Tulane University and finished the advanced management program at Harvard University Graduate School of Business Administration.

Early career . . . Hunter started his oil career in 1932 as an accountant in the marketing department of Standard Oil Co. of Louisiana at New Orleans.

Some men get ahead in the business world by marrying the boss' daughter. But Hunter came up the hard way. He married the boss' secretary.

The secretary in this case was Theresa Irvine, right-hand lady of John A. Bechtold, vice president of the company Hunter worked for. She and Hunter were married at New Orleans in 1937.

Since any boss hates to lose a good secretary, Hunter's marriage might have appeared a little undiplomatic. But obviously it didn't hurt his career much. Just 4 days after his forty-ninth birthday he became head of two of the country's major pipeline companies.

Hunter was promoted to chief tax accountant for Standard of Louisiana and transferred to Baton Rouge in 1940.

Five years later, Interstate was formed to take over the pipeline operations of Standard of Louisiana and Oklahoma Pipe Line Co. Hunter was transferred to Tulsa as secretary, tax attorney, and director of the new company. He has lived at Shreveport since 1951, when the firm moved its headquarters there.

The Hunters have three children—Frances, 15; Harriet, 12, and David, 8.

Pumpers' friend . . . During the years he has been secretary-treasurer of Interstate, Hunter has become familiar with all phases of the company's operations. He is known as a gracious boss who seldom gets too busy to stop and chat at pump stations along the company's crude lines, which extend through Louisiana, Mississippi, and Arkansas.

Yellowstone, in which Interstate has a 40 per cent interest, operates a new 540-mile products line from Billings, Mont., to Spokane, Wash. Hunter's headquarters will remain at Shreveport.

Like many executives, Hunter finds the higher he climbs in the business world, the less time he has for outside interests.

"My golf is suffering," he says, "and so is my hunting."

GEORGE WILSON

George A. Wilson has been elected president of TXL Oil Corp., Dallas, a new firm which recently acquired a large portion of the assets of Texas Pacific Land Trust. Wilson resigned as president of Interstate Oil Pipe Line Co. and Yellowstone Pipe Line Co. to accept the new position (see above). He succeeds **Col. George C. Fraser,** trustee and secretary of Texas Pacific Land Trust, who had served as interim president since formation of the new company in December. **Maurice Newton,** partner, Hallgarten & Co., and **Maurice Meyer, Jr.,** partner, Hirsch & Co., were elected TXL directors.

James C. Hayes, petroleum engineer with Moore & Gilmore, has been promoted to manager of the Denver area by the firm. Hayes had been serving at Midland, Tex., before his promotion.

Jack C. Edens, assistant district geologist at Midland, Tex., has been promoted to district geologist by Stanolind Oil & Gas Co. Edens has been with Stanolind since 1943 and a member of the firm's geological staff at Midland since 1950.

George H. Landreth and **Bob Leibrock,** former engineers with Stanolind Oil & Gas Co., have formed a petroleum engineering firm in Midland, Tex. Landreth served with Stanolind for more than 5 years as a petroleum engineer in its Lubbock, Tex., and Midland districts, and Fort Worth division office. Leibrock was with Stanolind 11 years in various engineering capacities. Since March 1953, he had been district engineer in Stanolind's Midland office.

G. H. LANDRETH

BOB LEIBROCK

Forrest E. Wimbish, district geologist at Midland, Tex., for Magnolia Petroleum Co., has been placed in charge of an exploration program being conducted in Portugal by Socony-Vacuum Oil Co., Inc., parent firm of Magnolia. Headquarters for the operation will be in Lisbon. Replacing Wimbish as district geologist at Midland is **Owen H. Blexrud,** former district geologist for the firm at Wichita.

Charles F. Dodge has been named district geologist in Midland, Tex., for American Trading & Production Corp., replacing **C. T. Young,** who resigned recently. Prior to accepting the position with American Trading & Production, Dodge was a geology instructor at Arlington State College, Arlington, Tex.

James L. Pierce, manager of the geological and land departments at Midland, Tex., for Murphy Corp., has resigned to open offices in Midland as a consulting geologist. Pierce started with Murphy Corp. 5 years ago in Midland as a staff geologist. Since then he

PERSONALS

was promoted to district geologist and then to his most recent position as land and geological department manager.

Francis B. Flahive, vice president of Columbia Gas System Service Corp., has retired after 28 years of service with the company.

Howard J. Pixley has been named chemical operations engineer at Stanolind Oil & Gas Co.'s Brownsville Chemical Plant, Brownsville, Tex. Pixley has been with Stanolind since 1945. For the past several years he has been working in the firm's general offices in Tulsa.

F. A. Menken and **W. E. Dillon,** former officers of Tide Water Associated Oil Co., have opened petroleum-consulting offices in San Francisco. Both men recently retired from the company after a combined service of 46 years. Menken was vice president in charge of exploration for Tide Water's western operations, and Dillon was assistant vice president of Tide Water and was particularly active in the company's exploratory work in Saskatchewan.

F. A. MENKEN

W. E. DILLON

G. M. Knebel, manager of the exploration division of Standard Oil Co. (N. J.), has been elected the thirty-ninth president of the American Association of Petroleum Geologists. Knebel will take office on March 31 at the close of the organization's fortieth meeting, which will be held in the Statler Hotel, New York City, March 28-31. Knebel succeeds **Edward A. Koester,** consulting geologist of Wichita, who as retiring president automatically becomes a member of the executive committee. Other new officers who will take office and who become members of the executive committee are **Horace D. Thomas,** director of the Wyoming Geological Survey and professor of geology at the University of Wyoming, Laramie, vice president; **W. A. Waldschmidt,** consulting geologist, Midland, Tex., secretary-treasurer; and **W. C. Krumbein,** professor of geology of Northwestern University, Evanston, Ill., editor of the A.A.P.G. Bulletin of Petroleum Geology.

Los Angeles Nomads Elect Officers

The Los Angeles Chapter of Nomads recently held its annual election of officers. They are, left to right, seated, Ox Morgan, Falcon Products, Inc., 1954 sergeant-at-arms; John Flanagan, Johnston Testers, Inc., 1954 president and 1955 regent; Joe Schlarb, Chiksan Co., 1954 vice president and 1955 president; Leo Cypher, Baash-Ross Tool Co., 1954 and 1955 treasurer; Knight Templeton, S. R. Bowen Co., 1955 assistant secretary. Standing left to right, Harry Taylor, Bettis Rubber Co., 1955 assistant treasurer; Harry Hester, McCullough Tool Co., 1954 secretary and 1955 vice president; Bob Gaylord, Wagner-Morehouse, Inc., 1954 deputy sergeant-at-arms and 1955 sergeant-at-arms; and Pop Atkins, Emsco Manufacturing Co., 1954 assistant secretary and 1955 secretary. Officers not pictured are Earl Tavan, Ken Corp., 1954 assistant treasurer; Rex Collins, Hydril Co., 1955 deputy sergeant-at-arms; and Jim Hughes, Lane-Wells Co., regent 1954 and 1955.

Charles C. Hay, of Regina, and **J. Howard Kelly,** Q.C., of Calgary, have been appointed to the board of directors of Royalite Oil Co., Ltd. Hay, who is a native of Saskatchewan, was president and general manager of Hi-Way Refineries, Ltd., when Royalite purchased it last summer.

CHARLES C. HAY

Henry H. Neel has been named divisional exploration manager of Tide Water Associated Oil Co.'s western division. Neel, who joined the company in 1942 as a fossil washer at Ventura, Calif., had been serving as divisional geologist at San Francisco before his promotion.

Tom A. Hendricks, Stanolind Oil & Gas Co., has been elected president for 1955 of the Fort Worth Geological Society. Other new officers include: **Lynn K. Lee,** consultant, first vice president; **Arthur E. Dietert,** Cities Service Oil Co., second vice president; **Louis S. Wallace,** Signal Oil & Gas Co., secretary; and **George A. Bell,** Sinclair Oil & Gas Co., treasurer.

Don T. Lurvey has been named chief chemist by Natural Gas Pipeline Co. of America of its new control and testing laboratory near Joliet, Ill. Laboratory work was formerly carried on by the company at its Fritch, Tex., plant. **Robert P. Williams** has been named chemist at the new lab and **Tom R. Maudsley** has been named analytical chemist.

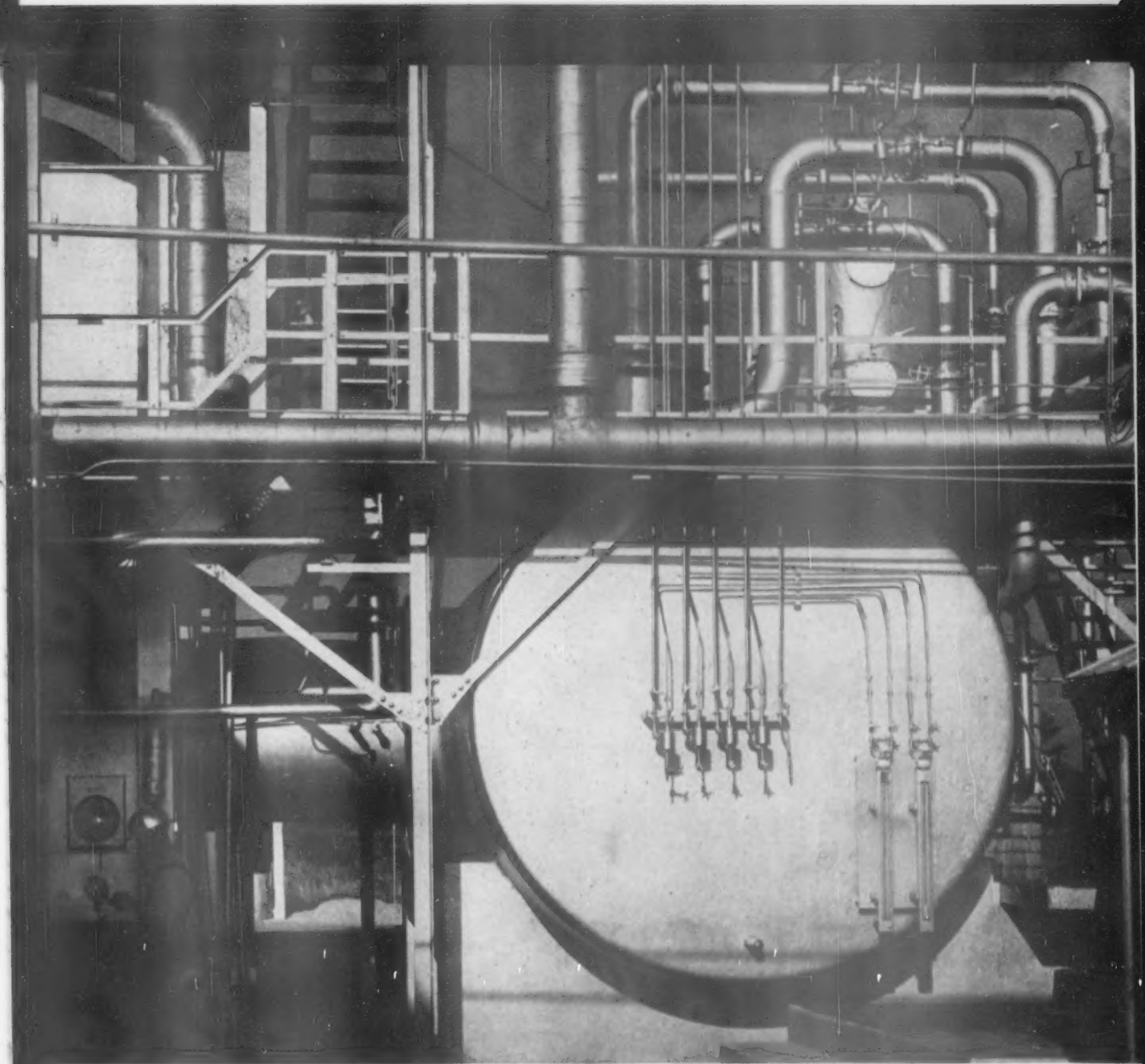
Ludlow Shonnard, Jr., and **Jay Davis, Jr.,** have been elected directors of Southern Counties Gas Co. Both men are vice presidents.

W. J. Holt, district foreman with Interstate Oil Pipe Line Co., has been transferred from Maysville, Okla., to Magnolia, Ark.

M. G. Rowe has been elected president of Rowan Drilling Co., Inc., and **Hamilton P. Rogers** has been named president of Rowan Oil Co., both of Fort Worth. Rowe, vice president before his promotion, succeeds **C. L. Rowan,** who replaces **Arch H. Rowan** as chairman of the board of directors. Arch Rowan will continue to serve as a member of the board. Rogers was

M. G. ROWE

H. P. ROGERS



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PERSONALS

vice president of Rowan Oil before his promotion. Rowe joined Rowan Drilling in 1944 as chief engineer. He later was named assistant vice president and then vice president in charge of drilling operations.

W. F. Davis, assistant general manager of Interstate Oil Pipe Line Co., has been elected a director of the company. Former assistant manager of Interstate's northern division with headquarters at Tulsa, Davis has been in

J. W. CASON

W. F. DAVIS

the company's general office in Shreveport since 1951. He was loaned to Lakehead Pipe Line Co. as manager from July 1950 to July 1951. J. W. Cason, a veteran of more than 40 years' service with Interstate and its predecessor companies was elected vice president and treasurer of Interstate. Cason had been comptroller and director of Interstate since its founding in 1945. **H. C. Bloomfield,** former assistant comptroller, succeeded Cason as conmptroller. Interstate also announced the promotion of **Frank R. Clark, Jr.,** to secretary of the company. He formerly was tax attorney.

Carl V. Fryer, former chief engineer at the Ardmore, Okla., refinery of the Ben Franklin Refining Co. division of Bell Oil & Gas Co., has resigned to become general manager of Chemical Solvents Co., Baton Rouge, La.

R. E. McAdams, former manager of exploration for Shell Oil Co.'s Denver area, has been appointed manager of the firm's exploration department with offices in New York City. McAdams, a graduate of Texas A. & M., has been a member of Shell's exploration since 1936. He joined Shell as a geologist in the Texas Gulf area in 1936 and had risen to assistant district geologist at the beginning of World War II. After serving with the Army from 1942 to 1945, he rejoined Shell as senior geologist in the Texas Gulf area. He was named manager of the Tulsa area exploration operations in 1947 and in 1953 was transferred to the Denver area.

Samuel E. Sims, former chief geologist with American Republics Corp., has joined Slick Oil Co., Ltd., as assistant to the managing partner, **A. K. Tyson.**

James A. Ransford has been appointed export manager of Tide Water Associated Oil Co.'s western division. He previously was assistant manager of wholesale sales in the company's western area.

Philip C. Dixon has been elected president of Middle States Petroleum Corp. to succeed Joseph Glass, who died recently. Dixon, a petroleum engineer, had been serving as a vice president of the firm since 1949. The board of Midstates Oil Corp., operating subsidiary of Middle States Petroleum, also elected Dixon president and director to succeed Glass.

F. M. Ricks, vice president, exploration, of Midwest Oil Corp., has moved his headquarters from Fort Worth to

F. M. RICKS

R. W. KLINE

Denver. Ricks, a graduate of the University of Oklahoma, joined Midwest in 1951 and was elected a director of the company in 1953. Before joining Midwest, he was with Pure Oil Co. and Southland Royalty Co. **Robert W. Kline,** a veteran of 7 years with Midwest, has been promoted to manager of the Fort Worth office to succeed Ricks. Kline will be in charge of company activities in Oklahoma, Louisiana, Arkansas, and parts of Texas.

DEATHS

James Marion Hewgley, Sr., 65, Tulsa oil man and drilling contractor, died January 29 in Wagoner, Okla., after injuries suffered a few hours earlier in an automobile wreck. Hewgley founded Hewgley Drilling Co. in the 1940's. He previously had been a business associate of Charles F. Urschel and the late Tom Slick, Sr., in the Slick-Urschel Oil Co. He worked for the firm in the Seminole, Okla., area and was field manager in Oklahoma City before coming to Tulsa in 1942. Besides his drilling firm, Hewgley owned oil properties in West Texas and Mississippi.

Julius Sakovics, 31, geophysicist with Gulf Oil Corp. the past 3 years, was killed recently in a fire at the company's new office building in Denver. A native of Pittsburgh, Sakovics moved to Denver last June from Midland, Tex.

James G. Westfall, 70, former owner of Westfall Drilling Co., of Tulsa, died recently in a hospital at Sapulpa, Okla. Westfall began his drilling career when Oklahoma was Indian Territory. He was active in northeastern Oklahoma until he retired in 1950.

Travis B. Dean, 47, Fort Worth independent oil operator, died in Fort Worth January 31.

Paul S. Nunley, 52, general traffic manager of Phillips Petroleum Co., died early Monday in a St. Louis hospital, where he was receiving treatment for a heart condition. Nunley had been with Phillips since it bought out the old Independent Oil Co.

Hiram H. Porter, 63, retired independent oil man, died recently at his home in Tulsa. Porter, a resident of Tulsa for more than 40 years, was head of the land department for the old Cosden Oil Co., and its successor, Mid-Continent Petroleum Corp. He retired and became an independent several years ago.

James B. Kitt, 54, founder of Signal Pipeline Construction Co., died recently at Long Beach, Calif., following a heart attack. Born in Michigan, Kitt moved to Long Beach in 1923 and founded Signal Pipeline in 1929.

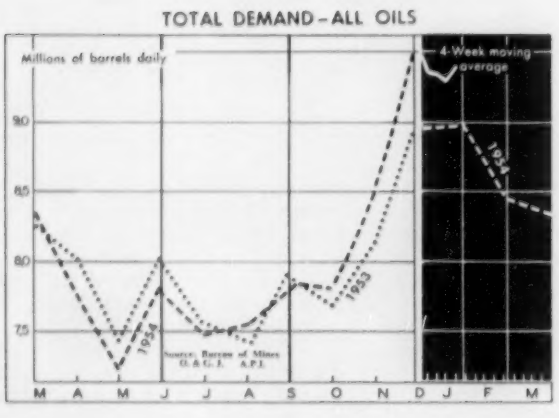
Charles C. Love, 49, district foreman at Seminole, Okla., for Skelly Oil Co., died at a Temple, Tex., clinic January 31.

George W. Herring, 56, right-of-way agent for Texas-New Mexico Pipe Line Co. for 33 years, died in Midland, Tex., January 28.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,689,275	UP	7,700	UP	471,585
Crude stocks	257,705,000	UP	1,186,000	DOWN	13,364,000
Completions	968	DOWN	136	DOWN	77
Refinery runs	7,402,000	UP	223,000	UP	454,000
Gasoline stocks	169,612,000	UP	3,327,000	UP	1,132,000
Distillate	89,032,000	DOWN	6,838,000	UP	5,508,000
Four-product stocks	331,713,000	DOWN	6,491,000	UP	11,566,000
Total imports	1,545,200	UP	439,000	UP	292,000



Crude Production Reaches All Time High of 6,650,000 Bbl. Daily

INCREASED allowables in some of the important crude-producing states for the month of January resulted in an all-time record for the month. Despite this high level of production, crude stocks were lower at the end of the month than at the beginning.

Weekly production figures for January average out about 6,650,000 bbl. daily. Crude imports amounted to about 700,000 bbl. daily, making a total of 7,350,000 bbl. daily.

Refinery runs averaged about 7,335,000 bbl. daily or 15,000 bbl. daily less than total crude supply. Other demand for crude, including exports, transfers, and losses, averages about 60,000 bbl. daily.

Since 15,000 bbl. daily of current production was left over after deducting refinery runs, 45,000 bbl. daily of the other demand had to come out of inventories. This rate of stock reduction would amount to about 1,500,000 bbl. for the month of January.

Most estimates of a desirable stock level for crude stocks fall within a range of a few million barrels on either side of 275,000,000 bbl. Crude stocks were a little under 260,000,000 bbl. at the first of the year. The small January reduction brought the crude total about 17,000,000 bbl. below the desirable working level.

Crude stocks may climb slightly in February. Production for the month, indicated by announced production allowables, may be slightly above the January average. Unless continued cold weather holds refinery runs to a high level this month, the actual demand for crude will fall below crude supply from production and imports.

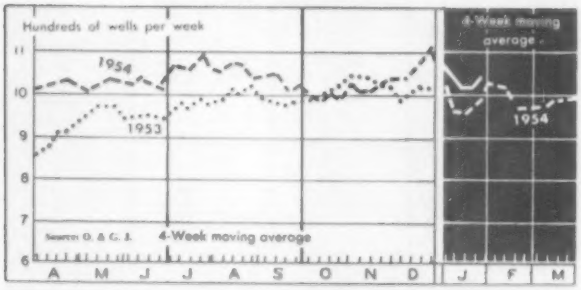
Since crude stocks at the end of January were about 17,000,000 bbl. below the normal working range, a gain in February will be desirable. A crude excess of 100,000 bbl. daily will add 3,000,000 bbl. to crude stocks in a month, but production and imports will have to be tailored to meet crude demand before stocks reach 275,000,000 bbl. If proration authorities wait for high inventories to force cuts in production, pressure on markets may be more serious than in 1954.

Cold weather boosts fuel sales . . . Lowest temperatures of the season in the high-demand areas of the North Central and Northeastern states pushed demand for fuel to record levels. Despite refinery runs of 7,402,000 bbl. daily for week ended January 28, fuel stocks took the sharpest drop of the season.

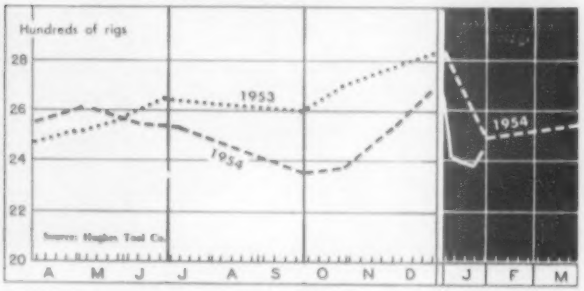
Kerosine stocks decreased 1,600,000 bbl. and distillate 6,800,000 bbl. Residual dropped 1,400,000 bbl. for an over-all reduction of almost 10,000,000 bbl. for fuels.

The need for fuel and need for sales both combined to raise distillate sales out of pipeline terminals in District 2. Cold weather increased the demand for light fuels, and jobbers were refilling empty tanks. Also, the period of free storage for heating oils ended on January 31. Suppliers were out selling distillate and moving it before they were charged for demurrage.

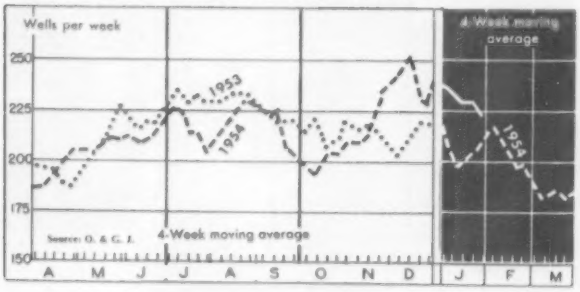
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

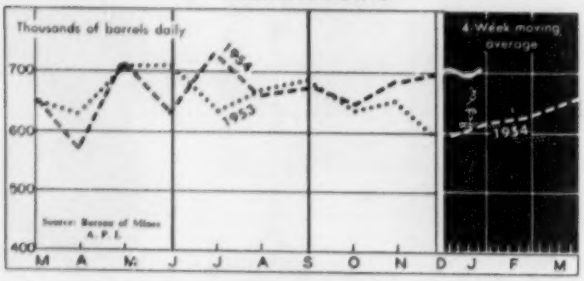
Area—	1-31-55	Change from 1-24-55	Change from 2-1-54
Gulf Coast	525	—10	11
N. and W. Texas-New Mexico	792	19	24
Arkansas-N. Louisiana-E. Texas	162	—10	9
Oklahoma	302	29	—56
Kansas-S. Nebraska	180	23	33
Illinois-Eastern	131	5	28
Rocky Mountain	200	2	—60
Pacific Coast	145	— 2	—13
Total United States	2,437	56	—24
Western Canada	193	0	57

WEEKLY WELL COMPLETIONS . . .WEEK ENDED JANUARY 29, 1955

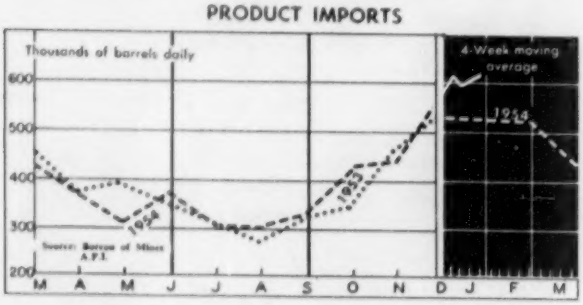
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	3	0	0	3	19,474	12	10	0	0	0	2	2	0	0	0	11	11
Arkansas	12	11	1	0	43,928	37	45	2	0	0	0	2	3	0	0	8	11
California	0	0	0	0	0	135	207	0	0	0	0	0	0	0	1	30	31
Colorado	30	9	4	17	165,951	106	74	4	0	2	8	14	4	0	4	52	60
Illinois	82	46	0	36	198,375	337	210	4	0	0	10	14	10	0	0	34	44
Indiana	6	1	0	5	6,419	50	65	0	0	0	1	1	2	0	0	13	15
Kansas	71	36	6	29	247,643	390	344	0	0	0	16	16	8	0	2	76	86
Kentucky	20	10	1	9	31,746	108	76	0	0	1	5	6	5	0	1	18	24
Louisiana	78	52	6	20	465,504	325	280	5	1	0	7	13	12	6	4	27	49
North	43	32	3	8	122,470	185	148	0	0	0	3	3	2	2	1	10	15
South	35	20	3	12	343,034	140	132	5	1	0	4	10	10	4	3	17	34
Michigan	17	3	3	11	54,651	56	58	0	0	0	8	8	1	0	0	24	25
Mississippi	7	3	0	4	48,582	31	22	0	0	0	3	3	0	0	0	12	12
Montana	7	4	0	3	46,184	31	15	0	0	0	2	2	1	0	0	9	10
Nebraska	6	3	0	3	35,759	47	33	1	0	0	2	3	3	0	0	23	26
New Mexico	20	11	2	7	74,406	76	137	0	0	0	2	2	0	0	0	9	9
Northwest	2	0	0	2	4,613	13	46	0	0	0	1	1	0	0	0	2	2
Southeast	18	11	2	5	69,793	63	91	0	0	0	1	1	0	0	0	7	7
North Dakota	2	2	0	0	16,494	14	22	0	0	0	0	0	0	0	0	3	3
Ohio	20	9	5	*6	43,560	77	71	0	0	0	1	1	0	0	2	4	6
Oklahoma	124	80	2	†42	412,529	578	737	2	0	1	9	12	7	0	2	53	62
Pennsylvania-New York	33	10	9	‡14	74,497	139	211	0	0	2	0	2	0	0	3	0	3
Texas	367	223	16	128	1,690,558	1,443	1,356	13	1	2	82	98	52	5	11	301	369
Southwest (1 & 4)	39	26	1	12	144,928	201	191	3	1	0	9	13	7	1	3	42	53
Gulf Coast (2 & 3)	54	25	6	23	353,200	211	214	0	0	2	11	13	5	4	6	50	65
East (5 & 6)	25	14	2	9	138,287	98	53	1	0	0	6	7	3	0	0	31	34
North Central (7-B & 9)	113	66	0	47	343,908	460	510	5	0	0	32	37	25	0	0	113	138
West (7-C & 8)	109	76	0	33	627,935	386	332	4	0	0	23	27	12	0	1	64	77
Panhandle (10)	27	16	7	4	82,300	87	56	0	0	0	1	1	0	0	1	1	2
Utah	0	0	0	0	0	5	8	0	0	0	0	0	0	0	0	4	4
West Virginia	14	1	12	1	31,197	50	40	0	0	1	0	1	0	0	2	0	2
Wyoming	49	30	1	18	256,346	84	129	1	0	1	6	8	1	0	1	16	18
Miscellaneous	0	0	0	0	0	3	5	0	0	0	0	0	0	0	0	3	3
Total United States	968	544	68	356	3,963,803	4,134	4,155	32	2	10	164	208	109	11	33	730	883
Total previous week	1,104	650	68	386	4,436,196			33	6	8	179	226	77	9	23	566	675
Total January 30, 1954	1,045	606	64	375	4,244,812			37	2	2	151	192	121	12	27	775	935

Service wells included: *2, †1, ‡8. California wells unavailable for week.

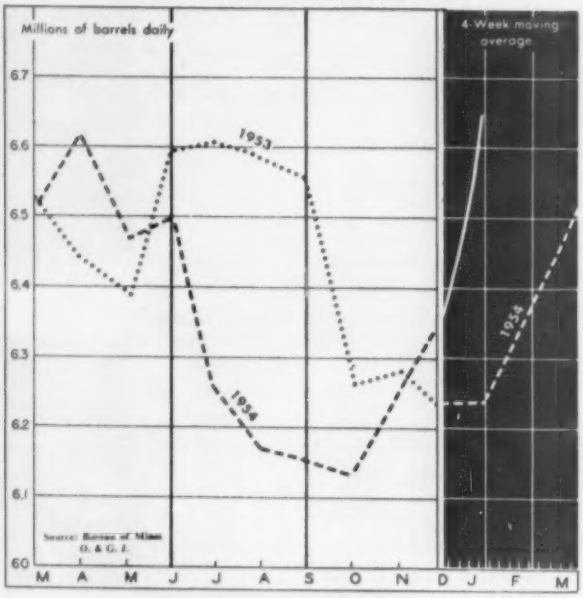
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

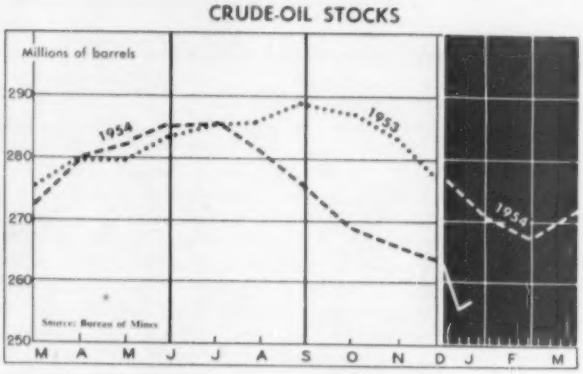


DAILY AVERAGE PRODUCTION FOR WEEK

	January 29 Crude oil	January 29 Lease condensate	January 29 Total	Jan. 22 total
Alabama	4,200		4,200	4,100
Arkansas	73,400	500	73,900	74,550
California	966,900		966,900	966,700
Colorado	140,800		140,800	141,700
Eastern	51,900		51,900	51,900
Florida	1,450		1,450	1,450
Illinois	201,200		201,200	204,200
Indiana	29,800		29,800	28,100
Kansas	334,900		334,900	334,500
Kentucky	39,400		39,400	39,200
Louisiana	636,250	53,000	689,250	689,950
North	104,250	3,000	107,250	107,950
South	532,000	50,000	582,000	582,000
Michigan	33,400		33,400	34,600
Mississippi	90,700	3,775	94,475	94,475
Montana	40,100		40,100	39,400
Nebraska	25,600		25,600	25,600
New Mexico	213,700	2,625	216,325	216,525
North Dakota	28,100		28,100	24,300
Oklahoma	528,400		528,400	525,300
Texas	2,861,000	52,975	2,913,975	2,913,975
Dist. 1	46,000	450	46,450	46,450
Dist. 2	149,000	8,075	157,075	157,075
Dist. 3	446,700	25,150	471,850	471,850
Dist. 4	252,000	6,175	258,175	258,175
Dist. 5	50,700	525	51,225	51,225
Dist. 6	123,700	5,500	129,200	129,200
East Texas field	240,500		240,500	240,500
Dist. 7-B	140,800	25	140,825	140,825
Dist. 7-C	179,600	4,550	184,150	184,150
Dist. 8	958,000	1,925	959,925	959,925
Dist. 9	189,000	575	189,575	189,575
Dist. 10	85,000	25	85,025	85,025
Utah	4,700		4,700	4,400
Wyoming	270,200		270,200	266,300
Others	‡300		‡300	350
Total U. S.	6,576,400	112,875	**6,689,275**	6,681,575
Change from previous week, up			**7,700**	
Canada	†328,950		†328,950	†335,450
Total U. S. production January 1-January 29				192,387,250 bbl.
Same period last year (crude plus cond.)				*180,989,260 bbl.

*Includes 2,851,200 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nov. 200.

CRUDE-OIL STOCKS



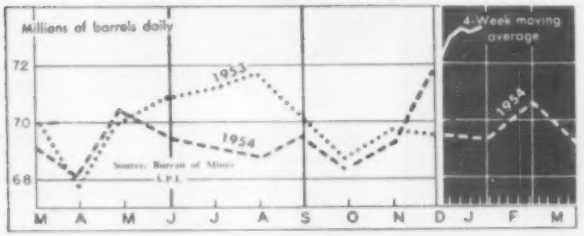
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

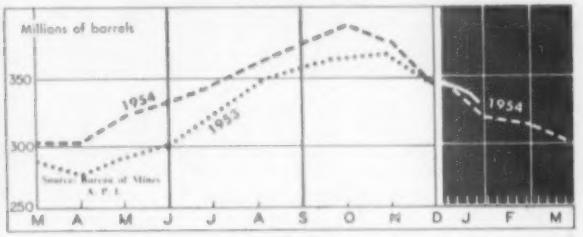
	Jan. 22, '55	Jan. 15, '55	Jan. 23, '54
Pennsylvania Grade	2,947	2,969	2,555
Other Appalachian	1,641	1,683	1,676
Illinois, Indiana, Michigan	10,642	10,798	11,464
Nebraska, North Dakota	1,917	1,848	(‡)
Kansas	8,942	8,474	9,534
Oklahoma	25,081	24,917	27,637
Arkansas	2,915	2,851	3,296
Louisiana	14,303	14,700	15,968
North	2,315	2,246	2,812
South	11,988	12,454	13,156
Mississippi	3,104	3,205	3,531
New Mexico	7,726	7,782	8,595
Texas	118,010	117,238	126,911
East Texas proper	9,820	9,663	11,186
West Texas	50,567	51,272	54,695
Texas Gulf	24,718	23,884	26,998
Other Texas	32,905	32,419	34,032
Wyoming	14,616	13,208	13,458
Other Rocky Mountain	5,639	5,999	3,222
California	30,777	30,377	33,060
Foreign	†9,445	10,470	10,162
Total	257,705	256,519	271,069

*Bureau of Mines. †Includes 3,029,000 bbl. in California. ‡Included with Kansas.

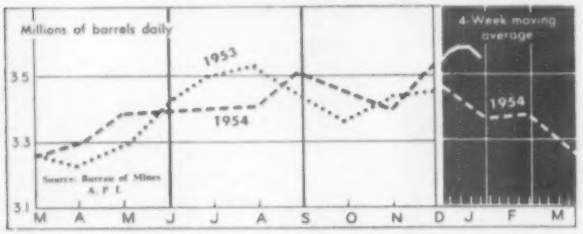
REFINERY RUNS



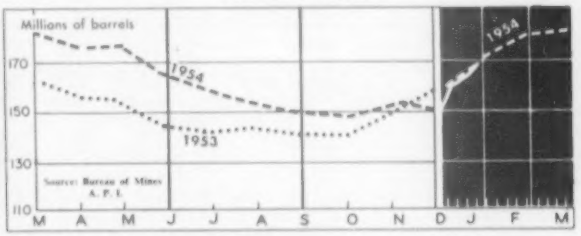
FOUR-PRODUCT STOCKS



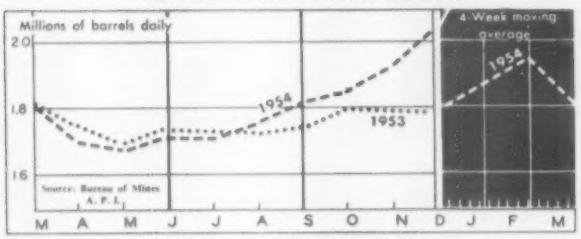
GASOLINE PRODUCTION



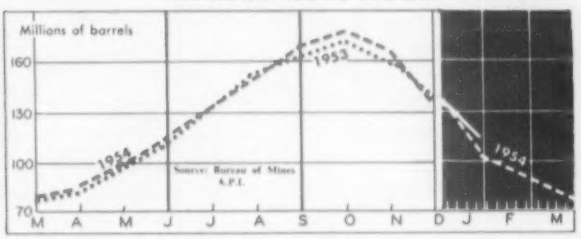
GASOLINE STOCKS



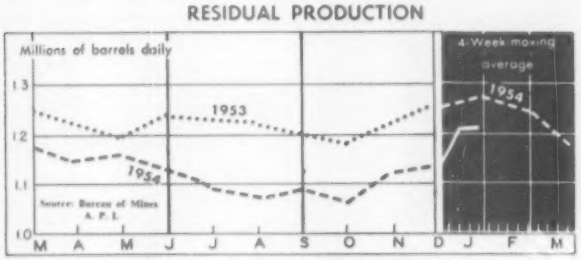
MIDDLE-DISTILLATE PRODUCTION



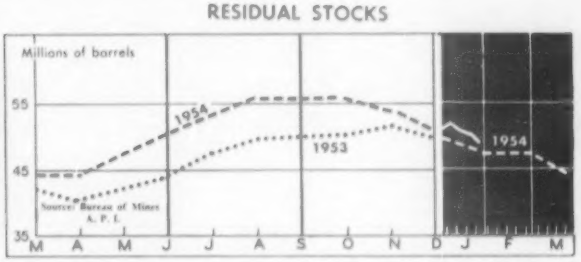
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JANUARY 28

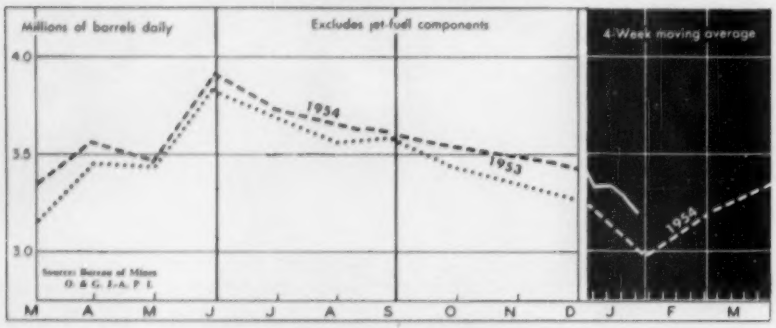
(Excludes all jet-fuel components)

(Thousands of barrels)

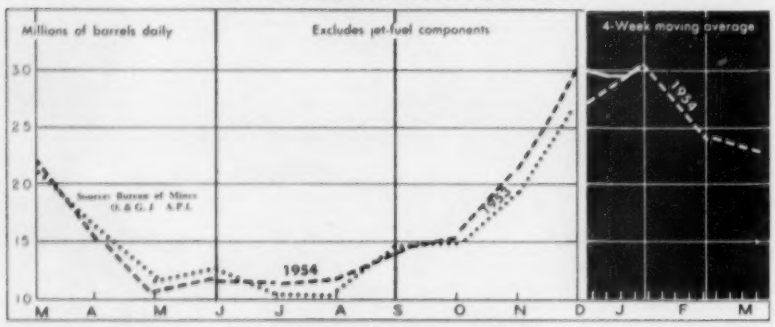
District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1954: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,143	474.3	50.4	306.6	240.4	34,209	9,850	32,077	8,842	1,043	424.7	40.0	253.2	253.4
Appalachian:														
District 1	96	42.3	7.0	24.7	7.3	4,834	598	2,000	430	117	47.0	7.0	26.4	15.6
District 2	102	49.7	9.4	18.1	13.9	2,270	337	613	253	95	49.4	7.6	17.1	15.1
Ind., Ill., Ky.	1,358	659.7	84.6	288.4	182.0	37,768	6,618	16,407	3,332	1,310	692.6	86.5	241.9	193.7
Okla., Kans., Mo.	679	395.6	14.9	173.9	47.3	17,283	1,494	9,791	1,199	569	345.0	13.1	130.4	51.9
Inland Texas	257	180.7	10.4	45.3	23.9	6,211	317	1,480	1,311	241	169.0	13.5	37.3	30.6
Texas Gulf Coast	1,791	810.4	130.0	465.6	225.3	23,618	2,390	9,352	4,093	1,643	749.0	135.7	388.1	228.4
La. Gulf Coast	618	302.4	63.7	133.7	54.3	11,978	1,735	3,299	1,403	551	263.9	65.5	143.7	44.8
N. La. and Ark.	92	33.9	9.3	21.0	4.1	4,319	603	1,300	166	85	37.8	8.5	20.5	7.6
Rocky Mountain:														
New Mexico	15	9.4	1.0	2.9	2.7	173		89	29	19	12.0	1.0	2.5	3.3
Other Rocky Mt.	260	121.3	3.1	66.0	40.3	7,007	194	2,086	869	229	116.6	4.4	48.3	41.3
California	991	426.9	5.3	156.7	354.1	19,942	396	10,538	26,610	1,045	446.8	7.1	157.5	385.2
January 28, 1955	7,402	3,506.6	389.1	1,702.9	1,195.6	169,612	24,532	89,032	48,537	6,947	3,353.8	389.9	1,466.9	1,270.9
January 21, 1955	7,179	3,494.9	374.6	1,750.9	1,163.0	166,285	26,118	95,870	49,931					
January 30, 1954	6,948	3,320.7	362.7	1,464.7	1,187.4	168,480	21,710	83,524	46,433					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

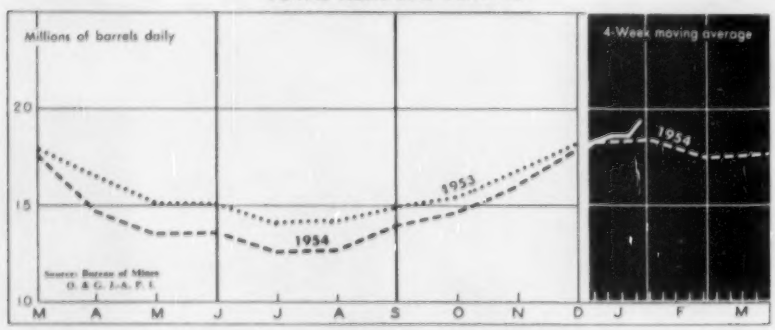
TOTAL GASOLINE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week moving average
1954
1953
Source: Bureau of Mines
O. & G. J.-A. P. I.
M A M J J A S O N D J F M

TOTAL MIDDLE-DISTILLATE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week moving average
1954
1953
Source: Bureau of Mines
O. & G. J.-A. P. I.
M A M J J A S O N D J F M

TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of February 2, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11.25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.75-9.875	10.7	9.5-9.75
No. 2 straw fuel oil	8.875-9.0	9.95	9.0-9.25
No. 6 residual	$1.50-1.60	$2.35-2.45	$1.85-2.00

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Colder weather in a large area of the north central and northeastern part of the country has tended to tighten both light and heavy fuel markets. High demands and limited supplies caused Esso Standard Oil Co. to raise tank-car and barge prices for residual in Louisiana.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 1-28-55	3,542	3,199
October 1954	3,362	3,515
December 1953	3,453	3,253
January 1954	3,354	2,985
Middle distillate:		
Four weeks ended 1-28-55	2,131	3,051
October 1954	1,854	1,513
December 1953	1,794	2,707
January 1954	1,857	3,076
Residual fuel:		
Four weeks ended 1-28-55	1,219	1,925
October 1954	1,066	1,448
December 1953	1,247	1,809
January 1954	1,271	1,831

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	
15-15.9	1.93	....	....	
16-16.9	1.99	....	....	
17-17.9	2.05	....	....	
18-18.9	2.11	....	....	
19-19.9	2.18	....	....	
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, January 21, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.50
Middle District	3.37
Southwest Pennsylvania	3.08
West Virginia	2.97
Buckeye Grade	2.91
Zanesville Grade	2.72
Illinois Basin	2.90-2.95

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FOR SALE EQUIPMENT

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

CORE DRILLS-URANIUM. Power core drills for all depths. New and used spudders, rotaries, well drilling equipment and supplies. Compressors for air operation. Pressey & Son, Pueblo, Colo.

FOR SALE: Used Model 15-A-15 Fluor Aerator Cooling Tower. To be dismantled by purchaser. Frawley Corp., 8790 Hays, Culver City, Calif.

THREE #12 Sweetland Filters, 48 bronze leaves, monel covered, on 3" C.C., now located in southwest, available for inspection. 11 Sperry 18" x 18" cast iron Filter presses. 11 chambers. Consolidated Products Co. Inc. #65 Garden Street, Hoboken, N. J. N. Y. Tel.: BArclay 7-0600.

GAS COMPRESSORS: Twin Clarks, Twin Bessemers, Twin Coopers, Angle Type units. Compressor Cylinders, Alfred B. Kern, 227 Wright Building, Tulsa 3, Oklahoma.

FOR SALE—At our Oklahoma City warehouse, attention T. P. Mace, 13" used Harcraft Hydropneumatic Pumping Unit, complete. Complete details upon request. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

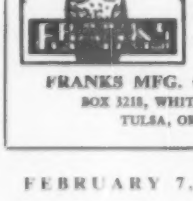
FOR SALE: Three type 80 Cooper Gas Engine Compressors completely rebuilt. Two type 80 Cooper Compressors as is. One 100 H.P. Superior as is or rebuilt. One Clark 100 H.P. Gas Engine driven Compressor. W. S. Smith, 205 Thompson Bldg., Tulsa, Okla.

DESULFURIZER

One 0.1 MM B. S. & B. skid-mounted desulfurizer capable of sweetening 100,000 cu. ft. of gas per day. Used short time. Located in West Texas. Contact Helmerich & Payne, F. F. Agee, 1st National Bank Bldg., phone 3-5104, Tulsa, or A. G. Post, Helmerich & Payne, McCamey, Tex.

USED EQUIPMENT

Two Franks Model 4000-TM Single Drum Well Servicing Units. Single Pole Mast. Truck Mounted.
Franks Model Super East Texas Single Drum Well Servicing Unit. Truck Mounted. Handles 6500' work.
Franks Model East Texas Single Drum Well Servicing Unit. Single Pole Mast. Truck Mounted. Handles 5000' work.
Two Cardwell Models KS Single Drum Well Servicing Unit. Single Pole Mast. Industrial engine. Mounted on trucks.



50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.
Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma.
O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE—Wilson Senior Rod & Tubing unit, mounted & fishplated on 2 Ton Chevrolet, complete with fishing tools, sand pumps, bailer and lines. Now working. Box H-598, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling. $90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

FOR SALE at Drumright, Oklahoma, 19,500' of 7"—20#—J-55 New Seamless Casing, attractive price. Deep Rock Oil Corp.—Huitt—Phone 2-4351—Tulsa.

FOR SALE—7,000 ft. 7" O.D. 26# Grade J-55 Range 2, 8 rd. thread New API Prime Casing, LT&C $2.10 per ft. F.O.B. cars, Pennsylvania location. The Buckeye Supply Company, 18 Harrison Street, Zanesville, Ohio.

FOR SALE—Model 36-L Bucyrus-Erie Drill Trailer mounted Casing Tackle Strut, and Tool Crane. Write or call Mr. Jim Ronhausen, R.F.D. #2, Fairdale Cambridge, Ohio, Phone 3-4427.

WALKER-NEER 32. SPC. Complete with tools for top to bottom drilling, new lines, all in good condition. Call 96-92240 or write Wm. H. Bass R.R. 9, Jennings Lane, Evansville, Ind.

WILSON GIANT Single Engine Drawworks in good condition, complete with JL1335 Buda Engine and Parkersburg Hydromatic Brake, reasonably priced. Write Louisiana Iron & Supply Company, Box 966, Longview, Texas, or call Plaza 9-4421.

FOR SALE: 3—Buda model PCS 1879-172 H.P. super charged 6-cylinder gas engines complete mounted on individual steel skids. Each engine is less one head. Price in present condition at our Geneseo, Kansas Pipe Line Yard, $1,500.00 each. 1—Cooper-Bessemer 550 H.P. diesel engine JS7RH #1571, 400 RPM, vertical 7-cylinder complete with Faulk gear coupling; Westinghouse speed increaser style 2L43953. Speed high side 3420 low side 400; connected to B J pump #152951 type OL 6-stage centrifugal 6-inch suction 4-inch discharge. Price in present condition and location installed at Pump Station near Hoisington, Kansas, $14,500.00. Contact Ray—Purchasing Department, Continental Oil Company, Ponca City, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

EXCELLENT DRILLING DERRICKS FOR SALE

2—EMSCO, Type 18, RHC 136 ft. x 26' Base Galvanized, Drilling derricks dismantled.
2—26' x 26' x 7'3" EMSCO 54HX Galvanized Steel Derrick Substructures.
1—IDECO—150 Ton—6 Sheave Crown Block.

South Texas Pipe & Supply Company
Box 3188 Phone 3-9337
Corpus Christi, Texas

FOR SALE EQUIPMENT

SALES AND RENTALS of Rotary and Cable tools. E. A. Kelly, Okla. City, 3125 S. E. 29th St. Box 861. JA 5-6407.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

FOR SALE—At Oklahoma City: 8—200 HP Bessemer type 10 gas engine compressor units, equipped with 17" x 20" Bessemer or Baash-Ross overhead exhaust power cylinders and 7" or 8" x 20" high and 14" x 20" low compressor cylinders. Contact T. P. Mace, Oklahoma City Warehouse or Cities Service Oil Co., Patridge, Bartlesville, Oklahoma.

FOR SALE—In Oklahoma City field one 30' x 86' x 12' sectional steel corrugated iron building, $1,750.00; one 30' x 40' x 10' DO, $750.00, both now erected. Contact T. P. Mace, Oklahoma City warehouse or Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE CHEAP. 85 Horse Power Miller Twin Engine with V belts, pulley with clutch, and line shaft. National Glass & Mfg. Co., Inc. 212 So. 9th St., Fort Smith, Ark.

N-3 BREWSTER Double Drum Drawworks with one WAK Waukesha engine—Excellent condition, $7,500.00. Box H-617, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: At Tallant, Oklahoma, two 5' x 56' absorbers, 20 trays, 24" spacing 500# WP, peak design each 40,000 MCFD at 350 PSIG; oil rate 100-300 GPM, Min. and Max. Bought new 1947, taken out of service 1954. Price $8500.00 each, with fittings, standing. Full data upon request. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100# 250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

FOR SALE EQUIPMENT

FOR SALE: Good used Pin & Pin Sucker Rods. A-1 Condition. 40,000'—¾" H&G Couplings. 20,000'—⅞" H&G Couplings. 30,000'—1" H&G Couplings. Prices on Application. Phone—wire—write, Sabine Pipe & Supply Company, P. O. Box 111, Kilgore, Texas. Phones 3094, 3095, 5533.

USED HYDRAULIC DRILLS and Mayhew Model 1000—Gardner-Denver Pumps. Drills mounted on Fords and Internationals. Good condition. Price range from $3500.00 to $5500.00. 3820 N.W. 39th Street, Oklahoma City, Oklahoma. Phone Windsor 2-5597.

FOR SALE: 4600 ft. good 3½" modified drill pipe. Take all, 80c ft. Will trade for 5½" casing. F. H. Graves, Box 583, Ardmore, Oklahoma. Phone 6337.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-8050.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WANTED: Failing 1500, or equivalent with long mast, large pump, and drill collars. Reply to Box 7064, Tulsa 18, Oklahoma.

WANTED GOOD 4500' Rotary Rig with 3½" drill pipe less derrick. Mail description price asked to Box 835, Houston 1, Texas.

WANTED: Good used well servicing unit for 1000 feet wells, mast required. Full information, price & inspection location. Box 392—Brilliant, Ohio.

HELP WANTED

PETROLEUM ENGINEER for reservoir section of aggressive independent oil company. Two to five years experience with one year of reservoir work preferred. Location—South Arkansas. Salary commensurate with experience and qualifications. Send detailed personal history and work experience to Box H-604, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS

for aggressive manufacturing company in midwest. Graduate engineers or engineering background, in design or development work for control equipment, used in oil and gas production. Organization also needs sales engineers experienced in above lines. Company offers excellent benefits with salary review every six months. Salary range $5000 to $7000. Company pays our service charges. All information confidential. Send resumes to

Chas. J. Loveless Personnel Service,
616 S. Main, Tulsa, Oklahoma.

PETROLEUM SALESMAN

Interested in Opportunity?

Long established and leading manufacturer and distributor of petroleum testing and laboratory equipment offers "lifetime opportunity." We are seeking Chem. Engineer, or equivalent, with refinery, refinery laboratory, or petroleum products sales experience.

Position is ground floor opportunity in new division offering personal and financial success. Salary, commission, and expenses included in compensation arrangements. Mid-west, or East & West Coast assignment after initial training in Chicago.

Your application for this career opportunity will be considered fully and confidentially. Include small photo, if available, in your detailed reply of personal and professional qualifications. Interviews will be conducted locally, and arranged for mutual convenience.

BOX H-614,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

WANTED: Mechanical Engineer to design and develop Line of Mud Pumps for prominent drilling rig manufacturer. Give experience and education. Box H-589, The Oil and Gas Journal, Tulsa, Oklahoma.

SENIOR GEOLOGIST—with minimum 10 years experience. Gulf Coast and/or Rocky Mt. background desired. Excellent opportunity for diligent man with aggressive expanding company with operations from Houston to Calgary. Initial location in Denver, Colorado. Salary and rank open depending on experience. Box H-615, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER with Masters Degree, or Doctor's in Chemical, Mechanical, or Petroleum Engineering, for research and teaching in Reservoir Mechanics and related fields at rapidly growing Southwestern institution. Rank and salary open. twelve months employment possible, consulting work encouraged and available in immediate area. Applications will be kept confidential. Box H-570, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT
EGYPT—Graduate Engineers with some production experience. Our Fee Paid.
SOUTH AMERICA—Graduate Engineers with some Petroleum experience—Recent Graduate Engineers, no experience required—Tool Pushers, three years experience—Reservoir Engineers, one year's experience—Geologists, must be single. Our Fee Paid. All information confidential. Send resumes to

Chas. J. Loveless Personnel Service
616 South Main Tulsa, Oklahoma

Experienced Reservoir Engineer

An experienced, technically trained reservoir engineer is needed for unit operations. Must be graduate petroleum engineer, approximately 35 years old, with several years training in actual field operations and reservoir control. Please send details of training and experience to

BOX H-600,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

REFINERY OPERATORS
LIGHT OIL TREATING
and
GAS RECOVERY UNITS
SANTOS, BRAZIL

Extensive experience operating light oil treating & gas recovery units. Responsibility will be similar to shift foreman supervising operations & instructing Brazilian personnel in operation of these units for new 45,000 bpd refinery producing gasoline, diesel and heavy fuels by thermal cracking & catalytic polymerization.

Challenging opportunity. 18-24 months foreign employment, excellent base salary plus living allowance and production bonus. Families transported to Brazil at our expense.

Interviews arranged at our expense on basis of confidential complete chronological resume, including education and employment (names & addresses of employers, dates employed, positions held & your specific duties & scope of responsibility, salaries received, location & type of jobs, etc.). Airmail data to

PERSONNEL DEPARTMENT:

HYDROCARBON RESEARCH, INC.

115 Broadway New York 6, N. Y.

HELP WANTED

EXPERIENCED EMPLOYEES, for all positions on seismograph field crews, wanted by aggressive, expanding geophysical company. Please give full details of education, experience, salary expected, in first letter. Box H-566, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY
SUPERINTENDENT

40 to 45, about $15,000.

Write, 'phone or call

PARVALE COMPANY
522 Fifth Avenue
New York City

GEOLOGIST

Rapidly expanding independent oil company has opening in Tulsa office for qualified sub-surface geologist. Must be particularly familiar with Mid-Continent area. Major oil company experience preferable. Must be well qualified to do mapping and logging interpretations, lease and deal recommendations. Age limit 35. Excellent position for right party. Give complete summary of experience and qualifications in letter. All replies confidential.

BOX H-580,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GEOLOGISTS

Attractive staff positions are available with affiliates of Standard Oil Company (New Jersey) in South America and elsewhere. Five - ten years experience required, including several years experience as surface party chief. Assignments will include general regional studies. Positions also available for surface party chiefs for reconnaissance assignments on world-wide basis.

Attractive salaries, liberal annuity and savings programs offered.

Write, giving age, marital status, education and experience in detail.

Box 308-E,
RADIO CITY STATION,
New York 19, N. Y.

CHIEF CHEMIST

Independent refinery requires graduate chemist or chemical engineer, reporting directly to Plant Manager, to supervise testing and analytical laboratory. Must have minimum of four years refinery laboratory experience. Duties will include product blending and quality control.

Send resume giving complete details of experience and salary requirements to:

Great Northern Oil Company

P. O. Box 3596
Saint Paul 1, Minnesota

HELP WANTED

DRILLING REPRESENTATIVE

Major drilling company has opening for contact and public relations man in Texas, between ages of 30 and 40. Must be well acquainted with oil fraternity and have good personality. Drilling experience desirable. Must be able to furnish excellent references, past employment record, and educational background. Good position for right party. Box H-610, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS—Want young engineers with up to four years experience in drilling, production or reservoir work for immediate employment in Rocky Mountain Area. Salary commensurate with experience and training. Box H-603, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST under 30, with some Illinois Basin experience, to join geological staff of small, expanding, well established independent producing company. Work primarily in Illinois Basin. State age, required starting salary, education, previous experience, and references. Box H-605, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Seismograph Party Chief Wanted by established contract Seismograph Company. Salary commensurate with experience. Give full qualifications and references in letter of reply. Box H-601, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY ENGINEERS
needed in
SOUTH AMERICA

Attractive staff positions are available with affiliates of Standard Oil Company (N.J.) for qualified experienced technical graduates.
MECHANICAL ENGINEERS—Must be thoroughly qualified and experienced design and/or maintenance of refinery or chemical plant equipment including piping, pressure vessels, heat exchangers.
CHEMICAL ENGINEERS and/or CHEMISTS—Assignments in process engineering will include economic studies and preparation of refinery operating programs. CHEMISTS will investigate problems of developing new products and processing methods.
Attractive salaries, liberal annuity and savings program offered.
Write, giving age, marital status, education and details of previous experience.

Box 308-F,
RADIO CITY STATION,
New York 19, N. Y.

SITUATIONS WANTED

FOREIGN EMPLOYMENT: Presently employed as District Superintendent in Venezuela supervising 300 employees in Drilling, Production, Refinery, Gasoline Plant, Recycling Plant. Complete knowledge of labor and petroleum laws. Graduate Petroleum Engineer. Desire change to Independent or Progressive Company bidding on concessions. Available on short notice. Please write Box 983, Freeport, Texas.

EXPERIENCED LANDMAN—32, married, 9 years experience land department, field and office. Desire position with major, independent or drilling company that offers advancement commensurate with ability. Box H-618, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY
P. O. Box 1628, Hobbs, New Mexico
Phone 3-3141.
146 Allen Building, Midland, Texas.
Phone 2-2962.

SITUATIONS WANTED

LANDMAN-ATTORNEY, well qualified, widely experienced. Desires change for more opportunity. Box H-620, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, Major Company and Consulting background, experience mostly Gulf Coast, capable handling exploration program, drilling deals, detailed subsurface studies. Desires connection with independent firm or consulting organization. Box H-613, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEERING SPECIALIST. Good knowledge overall refinery processing. Highly experienced fluid and moving bed cracking, catalytic reforming, other conversion processes. Industry contacts. Present salary supervisory capacity $12,300. Box H-612, The Oil and Gas Journal, Tulsa, Oklahoma.

TERMINAL MANAGEMENT abroad, in U. S. or Canada wanted by deep sea captain, age 42, fully familiar with all tankers and terminal operations, 6 years management large terminal, 3 years refinery engineering experience, several languages, presently employed, highest references. Box H-621, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER. Graduate, 10 years drilling, production, workover, appraisal and management experience desires to relocate. Prefer Mid-Continent or Gulf Coast Area. Box H-593, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING & PRODUCTION Superintendent, 20 years varied experience, 43 years of age. Best of reference. Box H-594, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED PETROLEUM ENGINEER, seven years diversified: primary drilling, producing, reservoir, lease evaluation, production research, unitization, extensive waterflood experience. Major and independent companies, Texas, Louisiana, Mississippi, Arkansas, Kansas, Oklahoma. Employed. Desire more responsible position. Box H-611, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL SCOUT, 3½ years Gas and Economics Department, presently scouted 5 months for same major in Rocky Mountain area. BS, MBA in Management, A— average. Single, 31, desires Land Department work in Tulsa or Southwest. Box H-606, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL FORMS

KRAFTBILT FORMS, designed especially for the oil industry, are popular because they are efficient, economical. For plat sheets, well log strips, columnar pads, all production reporting forms, material transfers, truck reports, all administrative forms, ask for new Catalog 1154-K. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

WANTED

SETTLED OIL production wanted by independent operator direct from producer. P. O. Box 852, Oklahoma City, Oklahoma.

BUSINESS COST Reduction and Revenue Increasing Expert Solicits foreign business basis small share of Increased Profits; fixed fee, or salary. Box H-619, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—IDEAS

Inventions that are related or can be adapted to the oil industry. We offer capital, technical advice, patent assistance, market research, a manufacturing plant, and a sales outlet; everything to put your invention on the market. Write P. O. Box 1665, Houston 1, Texas.

OIL PROSPECTOR

AMAZING instructive geophysical literature free on request to oil prospectors and land owners. Write SURFACE OIL SURVEYS, 1414 Electric Bldg., Fort Worth, Texas.

LEASE AND DRILLING BLOCKS

TO LEASE FOR OIL, Gas and Uranium, 160 acres in Southeastern Tulsa County. Good prospects. $35 per acre. Box 493, Sapulpa, Okla.

LEASEHOLD GAS AND OIL Acreage. Approx. 20,000 acres adjacent to proposed Westcoast Transmission pipeline in Ft. St. John-Dawson Creek (British Columbia) area. Now available for immediate development. Contact Box H-602, The Oil and Gas Journal, Tulsa, Oklahoma.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
6635 Delmar Ave., St. Louis, Mo.

ACREAGE AVAILABLE
FOR EXPLORATORY DRILLING

KETA GAS & OIL COMPANY, continuing its program of offering sublease or farm-out acreage, is now prepared to offer, on excellent terms, acreage on the following prospects:
Rome-Orwell, Bradford County, Pennsylvania Cascade-Gamble, Lycoming County, Pennsylvania; Gore, Hampshire County, West Virginia.
These are recognized potential gas producing structures which are either completely or partially untested.
Full information may be obtained by writing or calling the company's office.

Keta Gas & Oil Company
460 Market Street
Williamsport, Pennsylvania
Telephone: Williamsport 2-6161

MINING-UNDERGROUND DEVELOPMENT

CONTRACT MINING

We have the experienced crew, the equipment and resources to do a good job of shaft sinking and mining for underground storage, or for mineral exploration and development. We would welcome an opportunity to figure with a responsible firm. Financial and trade references.

L. T. SHELDON, PARTNER,
BOB WHITE MINING COMPANY
Box 677, Miami, Okla.

WANTED

NEW EQUIPMENT LINES WANTED
IN HOUSTON TRADE AREA BY
established oil field machinery distributor
Proven Sales Engineers—Financially Responsible
Production—Pipe Line—Refinery
P. O. Box 244—Houston, Tex.

ROYALTIES

ROYALTY COMPANY for sale: With or without Production. Contact A. S. Berry, 817 Wright Bldg., Tulsa, Okla.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for new Catalog 1054-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Oklahoma.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

BUSINESS OPPORTUNITY

ORGANIZED GROUP of business men financially able to undertake uranium deals of unlimited size, operations, buying claims, active exploration, etc. You are dealing directly with us. Reasonable inquiries will receive prompt attention. Box H-587, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL COMPANY buying proven oil and gas production with incomes ranging from $25,000.00 to $300,000.00 per month. You are writing directly to company officials. Financial statement will be presented to reliable sellers, principals, and authorized brokers. Box H-586, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL FIELD EQUIPMENT Test location desired. Only independent producers considered with present facilities now handling minimum 100 BPD gas-Condensate or crude oil with about 1000 gas-oil native. Producer guaranteed minimum $750 plus all costs, other attractive benefits. Describe gas-oil separation facilities. Eastern location desired. Box H-622, The Oil and Gas Journal, Tulsa, Oklahoma.

REAL ESTATE

APPROXIMATELY 8000 SQUARE FEET OF OFFICE SPACE FOR RENT

Just 20 minutes from Downtown Tulsa in 5 story concrete Berryhill Office Building, in Sapulpa. Entire 5th Floor available at reasonable rent with Steam Heat, Light, Janitor and Elevator Service.

O. B. PICKETT, AGENT,
Box 346, Sapulpa, Oklahoma.

Equipment Men

Lane-Wells Announces Gulf Coast Changes

To facilitate operations in the Gulf Coast division during 1955, Lane-Wells Co. has announced the following executive and supervisory changes.

R. M. Rutledge, Jr., assistant to Gulf Coast division manager, has returned to his former assignment as division sales manager.

R. E. Bush, Gulf Coast division sales manager, has been reclassified to assistant to Gulf Coast division manager.

W. A. Johnston, assistant to Gulf Coast division manager, has been transferred to Wichita Falls within the North Central Texas district as district superintendent.

A. L. Boyd, district superintendent in the North Central Texas district has been named Houston district superintendent.

D. B. Wheeler, district superintendent in the Houston district, has been made assistant to Gulf Coast division manager. This will be a training assignment of approximately 9 month's duration, following which Wheeler will return to a district assignment.

Tulsa Welding School Offers Pipe Layout Course

Now available at Tulsa Welding School is a new pipe-layout course coordinated with its regular welding courses, according to Mike Badeen, president and director of the school. This course qualifies layout welders for all plant and refinery-fabrication work.

The courses offered by Tulsa Welding School are varied to students' needs and requirements. Offered are: a 405-hour combined course in pipe welding for pipeline, refinery, and industrial pipe, including pipe layout; a 300-hour course in pipeline welding, including

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pipe layout; a 300-hour course in refinery and industrial pipe welding, including pipe layout; a 100-hour course in plate and structural welding; and brush-up courses by the hour in refinery, industrial pipe, pipeline, and structural plate.

Swartwout Reorganizes Autronic Controls Division

Swartwout Co., manufacturer of process-control, power-plant, and industrial-ventilation equipment, has announced a complete sales and service organization of the company's Autronic process controls division.

Effective immediately, Autronic sales to the chemical process and refining industries will be divorced from the company's other divisions.

A regional product manager is being appointed to head up each of the eight new sales territories. These territories are New York-New England, Philadelphia-East Central, Great Lakes, Midwestern, Southwestern, Southeastern, and West Coast areas.

Hesler Co., with headquarters in Kansas City, Mo., continues as exclusive sales representatives for Swartwout Autronic controls for the entire State of Kansas and western Missouri.

Marmon-Herrington Names Division Sales Manager

Marmon-Herrington Co., Inc., has announced that Edward F. Ray has been appointed general sales manager of its all-wheel-drive truck division.

Ray will supervise a sales organization of Marmon-Herrington factory representatives and distributors in the United States and other countries. Marmon-Herrington service and part departments will also be supervised by the new general sales manager.

Joining Marmon-Herrington in 1942, Ray was appointed assistant sales manager of the all-wheel-drive truck division in 1948.

Jensen To Make and Sell Shortstir Mixers

Jensen Engineering Co. has acquired all facilities for the manufacture of Shortstir mixers, formerly made and sold by Sawyer-Jensen-Ross Co.

Formation of this company constitutes a normal separation of manufacture due to growth of the Shortstir mixer line. Sawyer-Jensen-Ross has been dissolved and Sawyer will continue manufacture of its construction-equipment line as Sawyer Manufacturing Co.

Jensen Engineering Co. will retain the same engineering, sales, and manufacturing personnel.

B-I-F Names Gwynne To Los Angeles Sales Post

B-I-F Industries, Inc., has announced the appointment of Robert M. Gwynne to the post of sales engineer for the Los Angeles office of B-I-F Pacific. Gwynne's experience with B-I-F Industries includes positions as serviceman, repair-parts manager, assistant service manager, and exhibit manager.

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LEGAL

SEALED BIDS for Oil and Gas leases on the Crow Indian Reservation, Montana, will be received in the Office of the Superintendent, Crow Agency, Montana, until 2:00 O'Clock (M.S.T.), TUESDAY, FEBRUARY 15TH, 1955 at which time they will be opened and publicly read. Seventeen (17) Units involving 33,342.00 acres of trust Indian lands, a portion of which mineral rights are reserved for the benefit of the Crow Tribe by Act of Congress, will be offered. For further detailed information and a list of lands advertised call or write: L. C. Lippert, Supt., Crow Indian Agency, Crow Agency, Montana.

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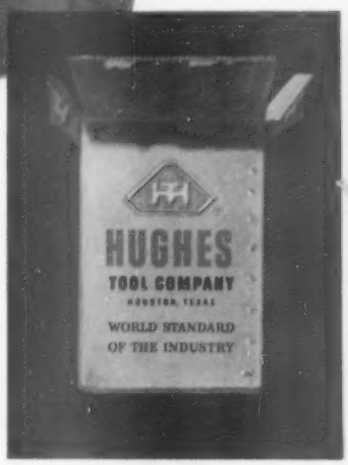
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